ELECTRONICS Australia

HiFi, Radio & Computers

MAY 1980

AUST $1.50* NZ $1.60

EA reviews the Wersi kit organ

Music Synthesisers & Stage Amplifiers

Car headlight reminder

Turn your TV into a CRO

Zero-voltage switching heat controller

Philips VLP video disc player

Dick proves you don't have to pay through the nose to get good tape

Consider the evidence:

– Our tape comes from a substantial manufacturer of bulk magnetic tape. This manufacturer is virtually unknown (compared to the big guys) but he turns out a tape of great quality and consistency. The tape is sold to companies all around the world.

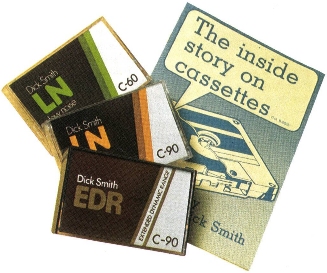
– We take this tape on 'webs' (large rolls) to our overseas factory. There it is tested, slit and assembled into cassette shells manufactured to our exact specifications. The product is tested again, packaged, sealed against dust and moisture and sent to us in Australia

– But the crazy thing is, despite the similar quality, we land the tape here for less than we can buy the big name tapes-either here or in Japan!

– After much head scratching we figured it out. The glossy colour ads (like this one-our first and only one) that use expensive models with big boobs in expensive magazines.An excercise revealed that the marketing costs for the big guys tape were staggering!

– At last we had it. But do we have to do the same thing before you believe us!
Do you want us to waste your money like that?

FREE! When you buy 10 or more Dick Smith cassette tapes you will receive FREE a copy of Dick's "The Inside Story on Cassettes" – normally priced at 50¢. This booklet is very informative and will give newcomers and the old hands a new insight into cassettes.



further evidence

The Dick Smith cassette tape is available as a high quality low noise tape for all audio purposes and the fantastic Extended Dynamic Range (EDR) cassette tape for top quality hi fi recordings.

C60LN Pay only **$1.50** each for 1-9
10 or more **$1.00** each. Cat C-3350

C90LN Pay only **$2.00** each for 1-9
10 or more **$1.20** each. Cat C-3352

C90EDR Pay only **$2.75** each for 1-9
10 or more **$1.90** each. Cat. C-3354

DICK SMITH ELECTRONICS

NSW 125 York Street, SYDNEY. Ph 290 3377
147 Hume Highway, CHULLORA. Ph 642 8922
162 Pacific Highway, GORE HILL. Ph 439 5311
30 Grose Street, PARRAMATTA Ph 683 1133
396 Lane Cove Rd, NORTH RYDE Ph 888 3200
263 Keira Street, WOLLONGONG. Ph 28 3800
613 Princes Highway, BLAKEHURST (Opening Soon)

VIC 399 Lonsdale Street, MELBOURNE. Ph 67 9834
656 Bridge Road, RICHMOND. Ph 428 1614
QLD 166 Logan Road, BURANDA. Ph 391 6233
842 Gympie Road, CHERMSIDE. Ph 59 6970
ACT 96 Gladstone Street, FYSHWICK. Ph 80 4944
SA 60 Wright Street, ADELAIDE. Ph 212 1962
WA 414 William Street, PERTH. Ph 328 6944

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113. Ph 888 3200. PACK & POST EXTRA.

bankcard
welcome here

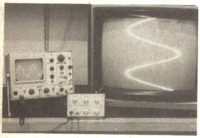
SHOPS OPEN 9AM to 5.30PM (Saturday: 9am till 12 noon) BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY
RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

ELECTRONICS Australia

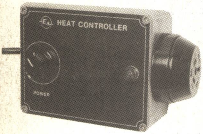
Volume 42 No. 2 **May, 1980**

Australia's largest selling electronics magazine

Easy-to-build TV CRO Adaptor



Developed in our workshop, this low-cost, plug-in adaptor converts any TV set into a useful low frequency oscilloscope. It's easy to build too. Full details on p42.



This new power controller generates no RF interference and can be used to control heating appliances such as radiators, vertical grillers and electric blankets. Why not build it for winter? Details on p50.

On the cover

Well-known organist Klaus Wunderlich with the magnificent Wersi "Galaxy W4SKT" kit organ. Staff member Ian Pogson describes the main features of the Wersi range in an article commencing on p22. (Photo courtesy Wersi's Aust. agents: Defi Agency, Burwood, Victoria). Inset shows the VLP video disc player which the Philips company plans to sell in Aust. early next year (story p8).

FEATURES

THE VLP VIDEO DISC PLAYER *Philips set sights on Aust. market* 8
MUSIC SYNTHESISERS *The new era of electronic music* 12
ELECTRONIC ORGANS THAT YOU BUILD YOURSELF *Wersi organ kit review* 8
ALL ABOUT STAGE AMPLIFIERS *By a working musician* 24

HIFI TOPICS AND REVIEWS

TECHNICS UNVEILS ITS RANGE FOR THE '80s *The latest in hifi gear* 32
SUPPLY SOURCES FOR THE PLAYMASTER 3-13L SPEAKER SYSTEM 33

PROJECTS AND CIRCUITS

PLAYMASTER 300W AUDIO AMPLIFIER PT. 1 *The design approach* 39
USE YOUR TV AS A LARGE SCREEN CRO *A simple TV CRO adaptor* 42
ZERO-VOLTAGE SWITCHING HEAT CONTROLLER *Minimises RF interference* 50
AN IN-CIRCUIT COMPONENT TESTER *Easy-to-build accessory for your CRO* 60
COURTESY LIGHT DELAY SYSTEM FOR CARS *Three more versions* 65
BASIC ELECTRONICS: BUZZ BAR *Build it & test you co-ordination* 72
BASIC ELECTRONICS: HEADLIGHT REMINDER ALARM *An end to flat batteries* ... 74

MICROCOMPUTERS

THE FIFTH WEST COAST COMPUTER FAIR *Jim Rowe reports* 105
DECODE MORSE WITH YOUR MICROCOMPUTER *General algorithms* 115
TRENDCOM 200 HIGH-SPEED THERMAL PRINTER *An in-depth review* 120

AMATEUR RADIO, CB SCENE, DX

AMATEUR RADIO *Upsurge of interest in radioteletype* 89
CB SCENE *Criticism — and the need for a better image* 97
SHORTWAVE SCENE *Chinese tune to foreign broadcasts* 95

COLUMNS

FORUM *The great TV set "bomb" scare* 28
THE SERVICEMAN *On lightning, kookaburras and Russian TV sets* 56
RECORD REVIEWS *Classical, popular and special interest* 80

DEPARTMENTS

EDITORIAL 3 — NEWS HIGHLIGHTS 4 — CIRCUIT & DESIGN IDEAS 69 — LETTERS TO THE EDITOR 76 — NEW PRODUCTS 98 — BOOKS & LITERATURE 102 — INFORMATION CENTRE 122 — MARKETPLACE 126 — NOTES & ERRATA NIL.

ANNOUNCING 6800O DEVELOPMENT SYSTEMS

The EXORmacs Development System for 68000 has just been announced. The system includes 15 slot chassis and power supply, MPU module, memory management module, deBUG module, 128K byte dynamic memory module, and an intelligent floppy disk controller module.

Software includes Structured Macro Assembler/Linkage Editor, screen based editor, symbolic deBUG and a PASCAL compiler.

Peripherals include intelligent CRT console, a 1 Mbyte, two drive double sided floppy disk, and a model 703 (180 CPS 132 column) line printer.

A large number of support modules are also available.

6800/6809 EXORciser Development Systems

The popular EXORciser II Development System is now available in both 6800 and 6809 versions. For those people already owning a 6800 EXORciser or EXORterm Development System, a 6809 upgrade kit is available. Both EXORcisers may be expanded to allow development of the

MC6802/MC6808
MC6801/MC6803/MC68701 MC6805

A wide range of support modules are available, including support modules for PIA, ACIA, SSDA, ADLC, GPIA, CRT controller and universal support module.

High level languages are available for —
6800: BASIC, FORTRAN, COBOL, MPL.
6809: FORTRAN, MPL, PASCAL.

Bulk storage is available on both single and double sided floppy disks. Up to 4 drives are supported.

A 10 Mbyte Hard Disk System is also available with expansion to 40 Mbyte. The Hard Disk System may co-reside with the floppy system to allow easy transfer of old files.

68000 Courses

Rank Electronics has much pleasure in announcing a visit from two leading Motorola lecturers to give courses on the MC68000.

Subjects will include both hardware and software aspects.

Course costs: $250.00 per head for each course.

Dates: Sydney — May 19, 20, 21 and 22.
Brisbane — May 23, 26 and 27.
Adelaide — May 28, 29 and 30.
Melbourne — June 2, 3, 4 and 5.
Hours: Sydney and Melbourne — 9.00 a.m. to 5.00 p.m.
Brisbane and Adelaide — 8.30 a.m. to 7.30 p.m.

For further details and application form please contact:

RANK ELECTRONICS
PTY LIMITED
INDUSTRIAL SYSTEMS

12 Barcoo Street, East Roseville, Sydney 2069.
Phone 406 5666

60 Rosebank Ave, Clayton South, Vic 3169
Telephone 541 8444

299 Montague Road, West End, Brisbane 4101.
Telephone 44 2851

101-105 Mooringe Avenue, Camden Park, SA 5038.
Telephone 294 6555

430 Newcastle Street, Perth 6000.
Phone 328 3933

120 Parry Street, Newcastle 2300.
Phone 26 2466

MAS5561

Editorial Viewpoint

EDITOR-IN-CHIEF
Neville Williams
M.I.R.E.E. (Aust.) (VK2XV)

TECHNICAL EDITOR
Leo Simpson

ASSISTANT EDITOR
Greg Swain, B.Sc. (Hons, Sydney)

TECHNICAL PROJECTS
Ron de Jong, B.E. (Hons, NSW), B.Sc.
John Clarke, B.E. (Elect., NSWIT)
Ian Pogson (VK2AZN/T)
Peter Vernon, B.A. L.L.B. (NSW)
Gerald Cohn

GRAPHICS
Robert Flynn

PRODUCTION
Danny Hooper

ADVERTISING MANAGER
Selwyn Sayers

CIRCULATION MANAGER
Alan Parker

CB radio is at the crossroads

In 1977, with much fuss and fanfare, citizens band radio in Australia was legalised. On the one hand, the move was seen as a victory for human rights and free speech; on the other an opportunity for numerous companies to make a fast buck. For a while, CB was very much the "in" thing.

But, within 12 months, the scene had changed. For many, the fast buck dream had turned into a nightmare. And the platitudes about human rights and free speech had been buried under an avalanche of everything from jargon to obscenity. From being a "cause", CB became the target for widespread ridicule.

Massive desertions from the ranks of licenced CBers followed, including at least two groups which the CB movement could ill afford to lose. One such involved many of the original human rights, free speech campaigners who had seen in CB a potential means of exchanging informed opinion on many subjects; they hadn't counted on the high level of adolescent ambient!

The other group included people with an evolving interest in the technology of communication. Many such have moved into the ranks of amateur radio and, despite fears to the contrary, have adopted the accepted manner and mores of the amateur fraternity.

A large proportion of those who remain under the CB mantle are not really CBers at all; they have no licence, no inhibitions about equipment, power, channels or the way they use those channels. Ultimately, the Government will have to crack down on them and a recent prosecution in Sydney may provide an advance sample: a $1000 fine, plus costs, plus confiscation of all equipment.

The very existence of this "pirate" group makes it tough for the diminishing number of the genuine, licenced CBers, who are trying to justify and retain their present privileges beyond July 1982.

As evidenced by our mail, activities of the "ratbag" element nourish community resentment of the pro-CB pressure tactics prior to '77. Far from serving the cause, those who indulge in, or foster, or excuse illegal operation, only darken what light there might be at the end of the tunnel. The "CB Service", so called, desperately needs a massive injection of unity, maturity and goodwill.

I'm not attacking legal CB. I'm simply saying very bluntly that, if legal CBers are going to earn recognition, they'll have to heed Jan Christensen's call, last month, to "get our act together"!

Neville Williams

Registered for posting as a publication — Category B.
Printed by Magazine Printers Pty Ltd, of Regent Street, Sydney and Masterprint Pty Ltd of Dubbo, NSW, for Sungravure Pty Ltd, of Regent St, Sydney.

Editorial Office
57 Regent St, Sydney 2008.
Phone (02) 699 3622 Telex 25027
Postal Address: PO Box 163, Beaconsfield 2014.

Advertising Offices
Sydney — 57 Regent St, Sydney 2008.
Phone (02) 699 3622 Telex 25027
Representative: Narciso Pimentel.

Melbourne — 392 Little Collins St, Melbourne 3000. Phone (03) 602 3033
Representative: Janis Wallace

Adelaide — Charles F. Brown & Associates Ltd, 254 Melbourne St, North Adelaide 5006
Representative: Sandy Shaw, (08) 267 4433.
Perth — 454 Murray Street, Perth 6000
Representative: Ashley Croft, (09) 21 8217.

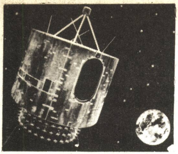
Subscriptions
Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001.
Enquiries: Phone (02) 20944, ext 2589.

Circulation Office
21 Morley Ave, Rosebery, Sydney 2018
Phone (02) 663 3911.

Distribution
Distributed in NSW by Sungravure Pty Ltd, 57 Regent St, Sydney; in Victoria by Sungravure Pty Ltd, 392 Little Collins Street, Melbourne; in South Australia by Sungravure Pty Ltd, 101-105 Weymouth St, Adelaide; in Western Australia by Sungravure Pty Ltd, 454 Murray Street, Perth; in Queensland by Gordon and Gotch (A'asia) Ltd; in Tasmania by Ingle Distributors, 93 Macquarie St, Hobart; in New Zealand by Gordon and Gotch (NZ) Ltd, Adelaide Rd, Wellington.

Copyright. All rights reserved
Devices or arrangements shown or described herein may embody patents. Information is furnished without responsibility for its use and without prejudice for patent rights. All manuscripts, photographs and other material submitted to Electronics Australia for publication must be accompanied by a stamped, addressed envelope. Contributions are submitted at the sender's risk, and responsibility for loss cannot be accepted by Electronics Australia.

*Recommended and maximum price only.



News Highlights

Rising production costs set to increase IC prices

Rising design and production costs and shortages of materials may mean an end to the steady price reductions which have been a feature of integrated circuit manufacture. Some manufacturers have stated that production costs could increase at an annual rate of 20-25% over the next few years, due to inflation and the rising cost of technological improvements.

The rise in gold prices has already forced most US manufacturers to add a "gold surcharge" to the price of their products, while others are looking for ways of replacing gold with less expensive materials. Makers of hybrid devices, and circuit connectors, which use large quantities of gold, are particularly active in this area, and efforts are intensifying as the price of the metal increases.

Manufacturers are being more selective in their use of gold as well as seeking substitutes and reclaiming precious metals from industrial waste. The Augat Corporation, for example, is using tin-lead plating of contacts on some of its range of connectors, reducing costs by 20%. And National Semiconductor Corporation has begun using copper foil to bond chips and leads in some ICs.

Perhaps surprisingly, silicon too is in short supply. Although it is the most abundant element in the Earth's crust, silicon can only be used in the form of polysilicons, and producers have not extended their manufacturing capability to keep pace with growing demands. In addition, the US Department of Energy's solar energy program has caused a huge demand for polysilicon. Some sources suggest that serious shortages could occur before the end of the year, and cause major disruptions by 1982.

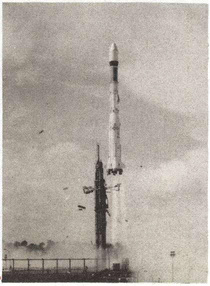
This situation could be alleviated by investigations of the use of gallium arsenide for the fabrication of integrated circuits. A study by IBM indicates that a sixfold increase in signal speed is possible through the use of gallium arsenide rather than silicon, and GaAs LSI circuits could be replacing the silicon chip by the mid-1980s.

Ariane — first flight orbits payload

The first flight of the European launch vehicle "Ariane" took place on December 24, 1979 at the Kourou Space Centre in French Guiana. The flight was successful, and a 1600kg payload was put into a 200km orbit.

"Ariane" is the result of a cooperative effort between 10 European nations, and is designed for a wide variety of missions, ranging from low orbits to the exploration of deep space. However, the major use for the launch vehicle will be to orbit communications and surveillance satellites for members of the European Space Agency (ESA).

Further test launchings of "Ariane" are scheduled for June, October, and December of 1980.



NS develops talking chip set

National Semiconductor Corporation will soon enter the rapidly expanding field of speech processing with a voice-synthesis chip set consisting of several n-channel MOS devices.

The voice synthesis system developed by NS transforms speech waveforms into digital information using pulse-code modulation compression techniques, and stores them for later output. From the stored information adult male and female and children's voices can be synthesised.

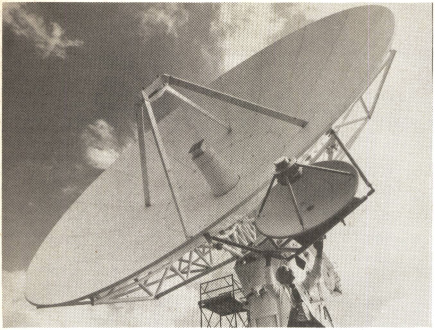
The chip set has a speech processor and a read-only memory that holds the compressed speech data as well as the frequency and amplitude information needed for speech output. When used with an external filter, amplifier, and speaker, the system will generate speech with the natural inflection and emphasis of the original sound. It is expected to be available by the middle of this year.

Worldwide trial for Prestel information system

The British Post Office has began international trials of Prestel, the world's largest computer-based information retrieval service. Using a data base in London, businessmen in six countries — Australia, the Netherlands, Switzerland, Sweden, West Germany, and the United States — will be able to telephone for international business information, which will then appear on a video terminal in the office.

By pushing buttons on a control pad resembling a pocket calculator, the Prestel user can call onto his display screen any of more than 150,000 pages of information stored in central computers and transmitted over telephone lines. Organisations providing information for the service include the BBC, the Economist, and Lloyds of London. Among users taking part in the trial are IBM, Rank Xerox, Sony, and Texas Instruments.

First catalog of sky infra-red



INFRA-RED SKY MAP — Currently under construction at the Rutherford and Appleton Laboratories in Southern England, this 12-metre dish antenna will transmit and receive signals from the Infra-Red Astronomical Satellite (IRAS) after its launch in 1981.

The primary objective of IRAS is to conduct the first detailed study of the infra-red spectrum of the universe and provide the first complete astronomical catalog of the sky in infra-red. Eighteen scientists from the three participating countries — Britain, the United States, and the Netherlands — are involved in the project. The satellite is due to be launched into a 900km near-polar orbit in August 1981.

Historic recordings left to deteriorate

On February 1 this year the National Library opened the Australian National Music Library and Sound Recordings Unit, the new home of its collection of 100 original music manuscripts, 65,000 music scores and 350,000 sound recordings.

The new surroundings are spacious and well-appointed, but an interested visitor could well be disappointed. Lack of staff, and a chronic shortage of funds are forcing the Music Library to reserve its facilities for researchers and for activities such as copying for public performances (which at least allows a wide audience to hear some items).

More seriously, staff shortages have halted the immense task of sorting and cataloguing the collection, and most of the material (sits on rows) of temporary shelving erected behind the library's new feature wall. Only 5000 recordings have been catalogued so far — less than 1.5% of the total.

Even more disturbing is the absence of any preservation program for the fragile historic records. Many early recordings, especially those of acetate on a glass or aluminium base, are in danger of deteriorating to a point where their contents will be lost forever. Despite widespread publicity as long as two years ago, no money has been allocated for preservation of the recordings, and none of the endangered items has been attended to.

The state of Australia's music archives will almost certainly be a point of concern when the newly formed Australian Branch of the International Association of Sound Archives (IASA) holds its first annual conference later this year. Among its other activities IASA keeps a keen eye on what is being done to preserve sound recordings throughout the world.

Voice recognition system sorts mail

Nippon Electric Company of Japan has developed a speech recognition system for sorting mail. The operators simply read off the address on envelopes and parcels and the computer sends them to the correct collection area. Such systems are not new, but this one boasts several new features. It needs to hear a spoken word only once to learn it, and is not affected by changes in speech of different operators.

OPEC energy share to drop during 1980s

OPEC's share of total world energy production will continue to decline during the 1980s, falling from 23% in the early 1970s to 17% by 1990, according to a report released by Predicasts, Inc, a US market research firm.

Predicasts state that coal production will increase as the United States and other countries seek alternatives to OPEC energy sources, and that non-hydrocarbon energy sources (including geothermal, solar, nuclear, and wave and wind power) will be used increasingly during the 1980s. Despite the many problems associated with their use, the report suggests that non-hydrocarbon sources will account for 12% of total world energy production by 1990. Total world energy production is expected to increase by 67% during the same period.

Cordless infra-red telephone receiver

A cordless telephone receiver which uses an infra-red data link has been developed by Siemens Industries Ltd.

The new telephone consists of two sections — a stationary transmitter/-receiver typically fixed to a wall; and a hand-held transmitter/receiver unit. All necessary controls are built into the hand-held unit so that the user can move freely while telephoning, with control pulses and speech transmitted between the two units by means of two infra-red channels.

The telephone is sensitive enough to be operated within closed rooms of up to 100 square metres. A built-in battery powers the hand/held unit and is automatically recharged when the receiver is hung up.

Meet our new advertising rep.

Janis Wallace

This happy smiling face belongs to our new Melbourne advertising representative Janis Wallace. Janis is keen to meet all our Melbourne advertisers as soon as possible, and can be contacted in Melbourne on (03) 602 3033.

BRIGHT STAR CRYSTALS PTY. LTD.

35 EILEEN ROAD, CLAYTON, VICTORIA, 3169, AUSTRALIA. TELEPHONE: 546-5076
NOTE: ALL MAIL P.O. BOX 42 SPRINGVALE, VIC. 3171 TELEX: AA36004

INTERSTATE AGENTS:

ROGERS ELECTRONICS
ADELAIDE. PHONE: 42 6666

J. E. WATERS PTY LTD
SYDNEY. PHONE: 666 8144

DILMOND INSTRUMENTS
HOBART. PHONE: 47 9077

FRED HOE & SONS PTY LTD
BRISBANE. PHONE: 277 4311

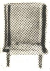
WEST TEST ELECTRONICS
PERTH. PHONE: 337 6393

BSC TELEX AA36004

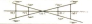
WITH MORE THAN 36 YEARS EXPERIENCE BRIGHT STAR CAN SUPPLY MOST OF YOUR CRYSTAL NEEDS

(WE ARE ALSO SUPPLIERS TO STATE AND COMMONWEALTH DEPARTMENTS AND CONTRACTORS TO DEFENCE FORCES)

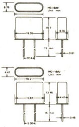
CRYSTAL UNITS FOR QUARTZ CRYSTAL CLOCK



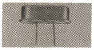
SPECIFICATIONS

	MODEL HC-6/W	MODEL HC-18/U
Nominal frequency	4194.304KHz However, to be variable upon request	4194.304KHz
Frequency tolerance	Max. ±20 ppm	
Storage temperature range	-30°C to +80°C	
Operable temperature range and freq. vs temp. charactor	Frequency shift at each temperature when 23°C is set to be reference within -10°C to +50°C. Temperature range to be as follows. 	
Loading capacity	12pF. However, to be variable upon request.	
Series resistance	max. 40 ohms	max. 50 ohms
Drive revel	1 mW	
Parallel capacitance	4.3pF	3.8pF
Capacitance ratio	Max. 250	
Aging rate	Less than ±3ppm/year	
Vibration	Freq. change Max. ±2 ppm Resist. change Max. ±10% Condition of vibration (1) Frequency 10 to 55Hz (2) Period 2 min. (3) Direction X, Y, Z 3 Direction (4) Time X, Y, Z each 30 min.	
Shock	Freq. change Max. ±2 ppm Resist. change Max. ±10% Condition of shock Naturally drop twice on the board from height of 50 cm.	

DIMENSIONS



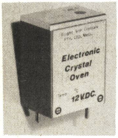
WATCH CRYSTALS

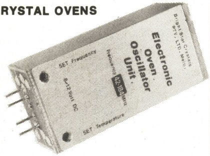


SPECIFICATIONS

1. Nominal Frequency	32.768KHz
2. Frequency Tolerance	±30 ppm/28° ±1°C
3. Drive Level	1μW max
4. Series Resistance	31.0k ohms max
5. Q Factor	40000 min
6. Parabolic Curvature Constant	Less than -0.04pp m/°C (Refer Fib. 1)
7. Turnover Temperature	28.0°C ± 5°C
8. Capacitance Ratio	700 max
9. Storage temperature Range	-30°C ~ +80°C
10. Operating Temperature Range	-10°C ~ +60°C
11. Aging rate	Less than ± 5ppm/year
12. Shock	Less than 5ppm for 50cm Hammer Shock Test
13. Package Size	

CRYSTAL OVENS

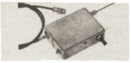



Bright Star Crystals Pty. Ltd. Melb.
Electronic Oven Oscillator Unit
SET Frequency
6-12 Volt DC
SET Temperature

BRIGHT STAR CRYSTALS ARE PLEASED TO ANNOUNCE A NEW RANGE OF ELECTRONIC CRYSTAL OVENS AND OVEN OSCILLATOR UNITS.

DATA SHEETS AVAILABLE ON REQUEST

WIDE BAND AMPLIFIER FOR FREQUENCY MEASUREMENTS



Bright Star Crystals have introduced a unique piece of test equipment for the communications technician, the WB-250 Wide Band Amplifier, which is designed to improve the sensitivity of most frequency counters. Operation is simplicity itself; the unit is plugged into the frequency counter and the probe is held near the oscillator whose frequency is to be measured. The frequency is then read on the counter. With no actual connection to the equipment under test there is no loading on the circuit, and very low level oscillator frequencies can be measured with ease. An inbuilt 10.7, 455 or 29798 IF marker can be supplied with the unit. Bandwidth is 100Hz to 250MHz, input sensitivity is 500μV and output is 100mV. The WB-250 is powered by a self-contained 9V battery.

NEW MODELS
C-MOS CLOCK FREQUENCY GENERATORS

Supply Requirements:
5 - 12 V Dc at 6 MA. No load.

Output Drive:
50 MA Model — 8 & 22
5 MA Model — 13

Stability:
Better than 1-PP/M

Operating Temperature Range:
0-60°C
Supply voltage to be nominated by user

Output frequency:
Nominated by user

Maximum Crystal Frequency:
5 Volt Supply - 5MHz max 12 Volt - 9MHz max

Crystal Frequency:
Required frequency X number counters
Frequency X 2x

NUMBER OF COUNTERS
BSC 6 BR 12 or 14
BSC 6 GP 24 or 28
BSC DC 12 BIN 4 Decade

BSC 6 BR also Supplied with outputs of 16x Baud rates of 300 to 9600 Baud

FORMULAR for crystals frequency:- (Required output frequency X 2x to give a crystal frequency of 2 to 8MHz ie. 100Hz X 2^{14} = 6553.6)

Output: Square wave 0 - .99 supply volts 1 - 5 MA Max.
Supply voltage 5 - 12 Volts Dc

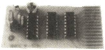
Stability: ± .003% / 0-60°c

PCB Dimensions

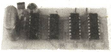
	length	width	height
BSC 6 BR	53mm	36mm	20mm
BSC 6 GP	70mm	36mm	26mm
BSC DC	75mm	38mm	26mm

Have BSC6 BR, BSC6 GP edge connectors.

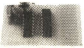
Crystal RF Modules also available 1MHz TO 200MHz



Model BSC 6 GP



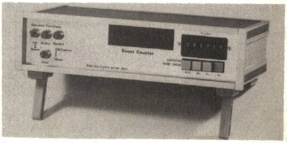
Model BSC DC



Model BSC 6 BR

MICROPROCESSOR CONTROLLED EVENT COUNTER

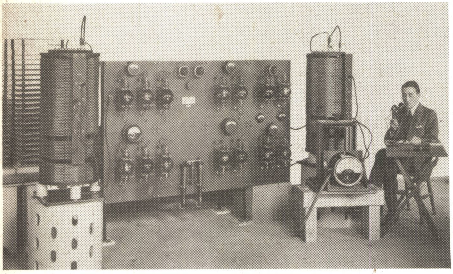
WITH TIME BASE



Send now for price and data sheets

NEWS HIGHLIGHTS

First woman radio broadcaster celebrates 60th anniversary



Marconi engineer W. T. Ditcham and the 6kW transmitter used for Mrs Collins' 1920 broadcasts.

Mrs Winifred Collins and husband Felix at their Chelmsford home last February.

Mrs Winifred Collins, the first woman to broadcast on radio, celebrated the 60th anniversary of her achievement as a guest of GEC-Marconi Electronics on February 27, 1980. In February and March of 1920, as Miss Winifred Sayer, she took part in the earliest experiments in broadcasting, made at the Marconi premises in Chelmsford.

In 1920 Captain H. J. Round of Marconi's Wireless Telegraph Company was granted a licence to experiment with wireless telephony. He decided to try "broadcasting" voice messages and find out if they could be picked up by stations around the United Kingdom. The broadcasts were to consist of readings and news items presented by Mr W. T. Ditcham, a Marconi engineer who had already carried out the first transatlantic voice transmissions.

To vary the program, Round decided to also include singers and musicians, and a group including an oboist, a clarinetist, and Miss Sayer performed three times in front of the microphone, becoming the first broadcasters in their field.

The programs were a great success. Reception reports were received from a large number of radio amateurs from as far away as Norway and Portugal. The transmissions were also reported by many ships at sea.

During June, July and August 1920 a number of advertised broadcasts were made by Dame Nellie Melba, Lauritz Melchoir, Jenny Lind and other famous singers, over-shadowing the pioneering efforts made four months before. Now, on the 60th anniversary of those early broadcasts, Mrs Collins' true position in radio history has been recognised.

Dick Smith moves Adelaide store

DICK SMITH'S Adelaide store has moved to much larger premises a few hundred metres away from the old location in Wright Street.
The new store, officially opened in March, is nearly half as big again as the previous store, and has off-street parking for 20 vehicles. It is located at 60 Wright Street, Adelaide; telephone 212 1962.

Airborne computer eases traffic congestion

The NSW Department of Main Roads is using a computer terminal fitted in a helicopter to remotely control Sydney's traffic lights. Remote control is possible because the Sydney Traffic System — said to be one of the most advanced in the world — consists of a linked system of computers and microprocessor traffic controllers. Each microprocessor controller — there are 250 installed, and a total of 1000 is planned — is programmed to optimise traffic flow at the intersection it controls.

An airborne terminal allows the operator to change traffic light timing to suit traffic conditions as observed from the air. The terminal uses a radio link to communicate with the controllers on the ground, and gives the operator access to any part of the system in the Sydney area.

Whoops! . . . wrong telephone number

Logic shop advert, p79, April issue — the Sydney telephone number listed is incorrect. The correct number is (02) 699 4910.

VIDEO DISC!

Philips sets sights on Aust. market with VLP player

The latest shot in the video disc war has been fired by Philips, which hopes to release its VLP laser system in Australia during the first quarter of 1981. Certainly, from a technological viewpoint, the VLP system is impressive. But what will the consumer think in light of emerging rival systems?

by GREG SWAIN

"Yes, we plan to market the VLP player in Australia" . . . "No, we can't tell you exactly when" . . . "The price? — about $750, but we can't be exactly sure!"

The occasion — a demonstration of the Philips VLP video disc player to the technical press in Sydney in March last.

But if Philips hoped to capitalise on the "gee whiz" factor of its (admittedly) innovative technology, there were no mouths agape! If anything, the technical press was slightly bemused as it watched the electronics giant dip its corporate toe tentatively into the Australian video disc marketplace.

Philips has every reason to be cautious about the video disc, in light of the VCR fiasco. Originally introduced with a fanfare, video cassette recorder hopes were hobbled from the outset by the old industry bugbear of non-standardisation. The result was consumer confusion and damaging rejection in the marketplace.

Now, barely two years later, the market looks set for a repeat performance with the video disc. Already the battle lines between the main antagonists are being drawn up, with the politics reaching an interesting stage of play.

Thus far, Philips would appear to have the front running with its revolutionary VLP laser system and powerful industry tie-ups. The company reached agreement with US film giant MCA as far back as 1974 to jointly develop the VLP system. This agreement gave Philips access to MCA's vast film library and VLP subsequently became known in the US as the "Magnavision" system.

MCA and Magnavox (a subsidiary of Dutch Philips) began marketing the VLP system in selected US cities early in 1979, but has yet to go nationwide. Initial market success, when 10,000 units were sold out within a few days of launch, has not been sustained as the market shows signs of caution at the purchase price of the unit and the discs.

Rival systems

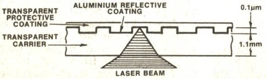
The most formidable opponent facing Philips is RCA, which recently revealed plans to sell its non-compatible SelectaVision system right across the US in the first quarter of 1981. Unlike VLP, SelectaVision employs grooved discs and a sled-like stylus pick-up. The signal is extracted by detecting capacitance differences between a metal electrode on the rear surface of the stylus and impressions in the surface of the conductive vinyl disc.

Although apparently inferior from a technological viewpoint, SelectaVision threatens VLP on several fronts: RCA says that the player will be about $250 less than the Philips unit; the records will be cheaper (Philips dispute this); and a tie-up with traditional arch-rival CBS Inc, together with RCA's own NBC Television sources, will ensure adequate software.

RCA will almost certainly trumpet its lower price and vast library when SelectaVision is introduced early next year. Moreover, the powerful Zenith Radio Corp recently selected RCA's technology and hopes to have compatible players and discs on sale in the US by mid-1981. Other big-name companies likely to climb onto the RCA bandwagon include General Electric Co and General Telephone & Electronic Corp.

Not surprisingly, the most interesting video disc politics are centred on Japan, with both Philips and RCA actively wooing the major companies. Again, Philips would appear to have the inside running, with Pioneer Electronics, Sony and Sharp all adherents to optical disc technology. At least one company,

SIGNAL PICKUP



Information on the VLP disc is read by a laser which scans from the centre outwards. Use of the laser facilitates special playing modes.

Universal-Pioneer (a jointly owned subsidiary of MCA and Pioneer Electronics) plans to market players that are compatible with Magnavision players, probably before the end of the year.

After that, the situation becomes clouded. Sony has entered into cross-licensing agreements with both Philips and Matsushita/JVC (which has developed yet another system); Sharp has taken out a licence to build a Philips-type player; and both Sanyo and Toshiba have displayed optical disc systems. The latter, incidentally, is also a licensee of the RCA capacitance disc system

The JVC VHD system must be regarded as a real threat to both Philips and RCA. Although a capacitance pick-up system, it is not compatible with RCA's SelectaVision. It employs a grooveless disc, tracked by a large sled-like stylus, with tracking information derived from control signals recorded alongside the program track — reminiscent of Philips.

But for the most part, the Japanese companies are keeping their options open while they await a governmental ruling on video disc standards. It may well be that Sony, Hitachi and other Japanese manufacturers will join forces with Matsushita and JVC to present a united front against Philips and RCA. However, the Japanese have yet to hurdle the software stumbling block in relation to their foreign market.

Despite this background, Philips is keen to release the VLP player onto the Australian market as soon as possible. By so doing, the company would capitalise on early market interest in video discs before competitive systems appeared. A likely scenario is a simultaneous launch of the VLP system in Britain and Australia early in 1981.

Philips has forshadowed a price around the US figure of $750 a unit and cautiously estimates the initial market to be about 10% of the colour TV market. The company has also placed tentative prices on the software, citing a three-disc album of a movie such as "The Sting" at about $25, with a single hour-long disc costing around $6.

How VLP works

Heart of the Philips VLP system is, of course, the laser pick-up. It works in conjunction with some pretty fancy optics to extract video and sound information from the reflective metallic surface of a 30cm disc for playback over a standard colour TV set. Playing time of the double-sided discs is 30 minutes per side for "standard-play" discs and 60 minutes per side for "extended-play" discs.

Philips is particularly proud of the laser technique because it means that no stylus ever touches the disc. In practice, this means that disc quality is unimpaired by repeated handling or use, an important advantage of the VLP system over rival systems.

Manufacture of the VLP discs closely resembles that of conventional LP records. A compound similar to normal gramophone material is first pressed between two moulds and subsequently coated with a thin, reflecting layer of aluminium. A plastic coating applied to the surface of the disc protects the recorded program from fingerprints, dust or surface scratches.

Information is recorded on the discs by means of a continuous spiral-shaped track which is read from the centre outwards. The way in which the information is recorded is completely different to normal gramophone records and takes the form of a sequence of microscopic oblong pits (see diagram). All the pits are of equal width and depth (0.4um and 0.1um respectively), but their length and spacing contains all the necessary information for extracting colour video and stereo sound.

Light from the 1mW He-Ne laser is focussed onto the track by means of a system of lenses and mirrors, and is reflected according to the track pattern. If the beam strikes the metal coated track section between the pits, practically all the light is reflected and imaged on the photo-detector system. But if the beam intercepts a pit, diffraction occurs and most of the reflected light bypasses the lens.

In addition, light reflected from the bottom of a pit is phase-shifted relative to any light reflected from the surface around the pits. This results in partial cancellation and further reduces the intensity of light reaching the detector diode each time a pit is encountered.

The detector diode produces a train of current pulses according to the pattern of pits scanned by the laser. These pulses are fed to the decoding and signal processing circuits to produce a modulated RF signal that can be coupled directly to the antenna terminals of a colour TV set.

Special playing modes

Combining the laser with a disc playback speed of 1500rpm has made possible a number of special playing modes that are difficult, if not impossible, to achieve with mechanical scanning systems. These special modes, available only with standard-play discs, include freeze frame, fast forward (three times normal speed), reverse, variable slow motion (forward and reverse), and search. The latter allows any segment of the program to be quickly located for immediate playback.

Pushbutton control and ease of operation are the main features of the VLP player. The unit is about the same size as a video cassette recorder.

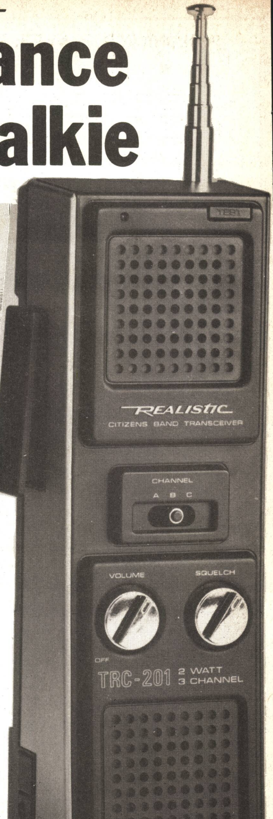
What's so magic about the 1500rpm figure? Well, 1500rpm equals 25Hz which coincides with the standard European (and Australian) TV frame rate. Each time a standard-play disc makes one complete revolution, one complete TV frame (or two fields) is displayed.

Consequently, the vertical blanking intervals containing the field synchronisation pulses always occur within two fixed diametrically opposite segments on the disc. Special playing modes are achieved simply by shifting the laser beam from one track to another during each successive blanking interval.

REALISTIC

Hi-Performance CB Walkie Talkie

Sale Ends May 31, 1980



39.95

Regular Retail Price **59.95**

SAVE $20

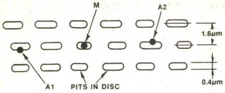
3 CHANNELS/2 WATTS

This is the Realistic TRC-201, and like all top walkie-talkies, has such features as automodulation for maximum talk power at all times, while range boost side-panels couple your body to the antenna system for extended range. Plus squelch, separate speaker, an electret condenser mike, charger jack and battery test button with LED indicator. With Channel 10 crystals and up to 2 optional crystals. Complete with wrist strap. 21-9201

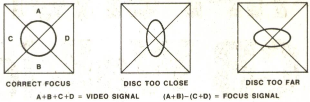
TANDY ELECTRONICS

Available at all Tandy Stores and Participating Dealers Around Australia or Mail Order Department, P.O. Box 229, Rydalmere, N.S.W. 2116

PHILIPS VLP PLAYER: TRACKING & FOCUSSING



This diagram shows the position of the two auxiliary beams A1 and A2 in relation to the main beam M. Signals derived from A1 and A2 control the beam centring mechanism.



Out-of-focus conditions result in an elliptical light spot on the composite photo-detector ABCD. A difference signal derived from the segments controls focussing, while the sum of the outputs provides the video signal.

Slow motion, for example, is obtained by repeating tracks; a still picture by continually repeating the same track; and fast forward by jumping to the next track every half revolution. A reverse jump every half revolution gives reverse motion at normal speed. For obvious reasons, the sound is automatically switched off for the special playing modes.

Extended-play discs do not have the vertical blanking intervals confined to two well defined segments. Instead, the track length of each field is held constant, allowing more information to be crammed on the disc to provide the double-length playing time. Although this means that the special playing modes are no longer available, it does not prevent other useful information — such as the frame number — from being added to several spare lines in the vertical blanking interval.

Note that, for extended-play discs, the motor speed must be varied (progressively slowed down) as the disc is played to ensure that the information is scanned at constant velocity.

Tracking and focussing

Radial tracking of the VLP disc is achieved by both mechanical and opto-electronic means. Mechanical tracking is achieved by mounting the optical system (including the laser) on a carriage which is moved along two guide rails by a small DC motor. During normal playback, the carriage is radially shifted at an average rate of 1.6um per disc revolution in response to a control signal derived from the beam centring circuit.

The opto-electronic beam centring arrangement is rather ingenious. It employs two auxiliary beams of light, derived by splitting the laser with a diffraction grating. These strike the track 20um in front of and behind the read-out beam and are slightly displaced from the centre of the track, in opposite directions, so that each is partly on and partly alongside the track.

During playback the two auxiliary beams are reflected from the surface of the disc and imaged on separate photo-detector circuits to produce a radial tracking control signal. This signal is used to control the position of a pivoting mirror assembly fitted in the light path immediately behind the objective. As the mirror pivots, it moves the read-out beam (and the two auxiliaries) in a radial direction to keep the tracking error within the required plus or minus 0.1um.

This arrangement also facilitates the various special playing modes described above. Beam "jump" from one track to the next is effected simply by applying an accelerating current pulse through the mirror coil, followed by a retarding pulse.

The way in which automatic focussing is achieved is equally ingenious. As already mentioned, the reflected scanning beam is imaged on a photo-detector diode, the output of which forms the required video information. This diode is, in reality, a composite detector composed of four separate quadrants.

By passing the reflected beam through a special lens, the light spot impinging on the composite detector forms a circle when the disc is in focus, and a vertical or horizontal ellipse for the two out-of-focus conditions (disc too close, or disc too far). Thus, when the disc is out of focus, the amounts of light received by each of the detector quadrants are no longer equal and a difference signal can be derived.

This difference signal is processed and used to correct the position of the objective which is driven by a coil in a radial magnetic field in much the same manner as a loudspeaker voice coil.

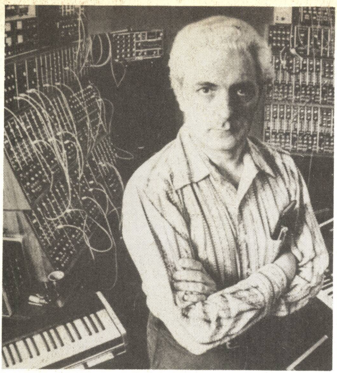
Motor speed, by the way, is

(continued on p128)

Special playing modes

VLP special playing modes include freeze frame, fast forward, reverse, slow motion and search. Double-sided discs play for either 30 or 60 minutes per side.

Music the new



LEFT: Best known of the engineers behind the synthesiser, Dr Robert Moog revolutionised synthesiser design with the concept of voltage control for pitch, harmonic content, and volume. Today a range of equipment bearing his name is available to the musician.

Spawned by solid-state electronics technology, music synthesisers have become popular with amateur and professional musicians alike. Here we clear away some of the mystery surrounding these unique musical instruments and take a brief look at what's available.

by CHRIS SHORT

To many people, anything that sounds "electronic" is automatically a synthesiser, but these versatile instruments are capable of a whole spectrum of tone colours, encompassing conventional voicings and natural sounds, as well as what is commonly termed electronic music.

Indeed, much of the music and sound effects that we hear on radio and television, especially in advertising, is produced by some sort of electronic synthesiser.

Synthesisers are truly the offspring of our developing electronic technology. Many of the functions of today's synthesisers would have been either impossible or too expensive to implement using discrete transistors.

While the first generation of synthesisers did rely heavily on transistorised circuits, it was only with the increased availability of low cost integrated circuits that the synthesiser became a commercial reality.

The modern (voltage controlled) synthesiser has been around for only a little over a decade, but the concept of electronic music synthesis goes back much further.

In 1921, an electronic music concert was held in Paris, at the theatre de Champs-Elysee, by Luigi Russolo. It met with moderate success but such shows were viewed as amusements rather than serious attempts at musical expression. It was not until later, after the Second World War, that electronic music began to present a broader profile, mainly due to the efforts of one man, Karlheinz Stockhausen.

Incorporating microprocessor control, the Prophet 5 from Sequential Circuits is an advanced polyphonic synthesiser that can play up to five notes simultaneously. Front panel settings can be stored in memory for later recall as required. (Orbital Music Pty Ltd, 503 Pittwater Rd, Brookvale, NSW 2100).

Stockhausen was a composer with the WDR (West German Radio) in Cologne. Using audio signal generators and various filtering circuits, he gave numerous performances, and travelled widely, espousing the virtues of the new art form. He was also responsible for setting up the first electronic music studio.

Stockhausen was not the only exponent of electronic music to reach the public. In France, too, composers began to find audiences. One man in particular, Bebe Barron, composed the score for the science fiction film "Forbidden Planet", which met with critical acclaim when it was released in 1954.

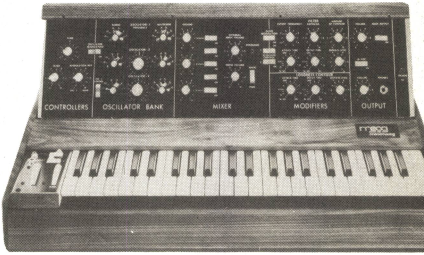
In the early days of electronic music, the composer was virtually on his own as far as specialised equipment went. All that was available were commercial audio frequency test oscillators, or cannabalised parts from early electronic organs. The major part of the composition was done after recording particular sounds on tape. Cutting, joining, reversing sections of tape, playing them at faster or slower speeds — all were part of the electronic composer's art.

When a particularly special sound was needed, or a large project embarked upon, the services of an electronics engineer were necessary. One engineer in particular, Robert Moog, was to revolutionise synthesiser design, and help shape the course of musical history.

In the mid-60s, Moog was approached to build several electronic

Synthesisers

era of electronic music



Particularly suited for live work, the Minimoog was one of the first small instruments on the market, but is still extremely popular. Although containing just the basics, it is an expressive instrument with a unique sound. (Farrells Total Music, 505 Pittwater Rd, Brookvale, NSW, 2100)

music modules. His aim was to make the actual process of producing electronic music easier. As previously stated, most composition was done "at the tape recorder", and generally a lot of time was wasted in creating a simple sound. An audio signal had to be created, then recorded, spliced, and treated to produce the desired effect.

These processes were so time consuming that any composition over several minutes duration was a major undertaking. In addition, the methods employed denied vital areas of control, specifically those involving dynamic control of the sound as it was being produced.

Moog realised that a new system was needed — one that would enable a more precise control over many parameters, and yet leave room for the composer to become directly involved in the sound he was creating.

Voltage control

To achieve this blend of precision and utility, Moog introduced the concept of voltage control. Whereas parameters such as pitch, harmonic content, and volume were previously controlled only by potentiometers, he designed circuits that responded to an analog control voltage applied to a special input.

For example, his voltage controlled oscillator (VCO) could be set to any desired basic frequency by means of a front panel control. The applied voltage level determined the output frequency — the higher the voltage, the higher the frequency. Moog eventually settled for a control scaling of one volt per octave, and this is now accepted as the industry standard.

VCOs are extremely versatile circuits. If a periodic variation in pitch is required, as in vibrato-type effects, a sine wave of suitable levels is applied to the input. Similarly, a square wave produces two alternating pitches, while a sawtooth wave gives rising pitch ramps such as those produced by motor vehicle alarms.

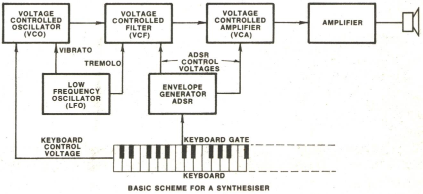
In order that the oscillator could be pitched to play with conventional instruments, Moog added a keyboard to the input. This keyboard simply gave out a rising series of voltage steps, depending on which key was pressed.

The modern synthesiser had been born!

Quickly following the VCO was a horde of similar voltage controlled modules. For dynamic control over harmonic content, the voltage controlled filter was designed. As the control voltage was increased, the cut-off frequency of the filter (a low-pass device) rose. Voltage controlled amplifiers determined volume in similar fashion.

Envelope generation

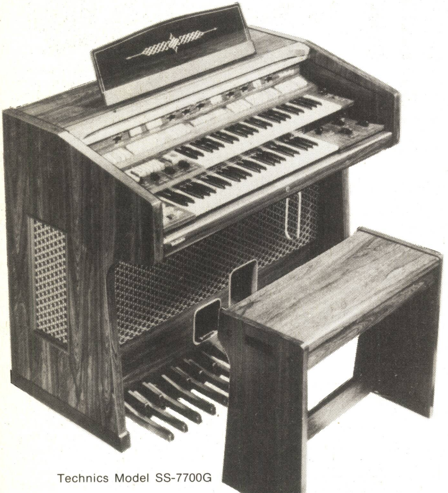
Together, these elements comprise the basic synthesiser system. For effec-


VOLTAGE CONTROLLED OSCILLATOR (VCO)
VOLTAGE CONTROLLED FILTER (VCF)
VOLTAGE CONTROLLED AMPLIFIER (VCA)
AMPLIFIER
VIBRATO
TREMOLO
ADSR CONTROL VOLTAGES
LOW FREQUENCY OSCILLATOR (LFO)
ENVELOPE GENERATOR ADSR
KEYBOARD CONTROL VOLTAGE
KEYBOARD GATE
KEYBOARD
BASIC SCHEME FOR A SYNTHESISER

Block schematic for a basic music synthesiser. The horizontal arrows denote the audio signal path, while the vertical arrows denote control voltages.

Technics technology has brough the electronic organ this far. Now you can clearly hear... the difference in sound.

Technics organs with programmed chord computer for accompaniment and much mor



Technics Model SS-7700G

This organ looks good . . .

Advanced features . . .

Cabinet. Solid, well-built appearance in superb wood-grain finish.

Celeste Effect. Brilliant and realistic ton from 3-channel sound.

String Ensemble. Brings out the variety and presence of a string ensemble.

Programmed Chord Computer. It records accompanying chords and sequence for automatic accompanimen (Comes with memory protection circuit.

Programmed Rhythm Computer. In addition to the 24 automatic rhythms, another 2 can be created and recorded in the memory. (Comes with memory protection circuit.)

Synthesized Harmonizer. Lets you create completely new sounds as on a synthesizer. You can even make the sounds of waves and wind.

Drawbars. These are used to freely adjus the volume of the individual feet to make delicate and broad tones.

Sustain Effect. Even after you take your finger off a key the tone does not disappear but continu naturally for a beautiful sustain.

Decay. Even with a key depressed, the tone decreases naturally.

One Pedal Full Bass System. A fast pedal solo is easy with one pedal.

Pre-Set Sounds. 8 types of tones allow solo playing with a touch of one button.

One Finger Auto Play Chord/Auto Arpeggio/Fill In/Walking Bass. Playing is easy and enjoyable.

Upper Tone Selector. Concentrated control system for greatly improved operation. (Illuminated)

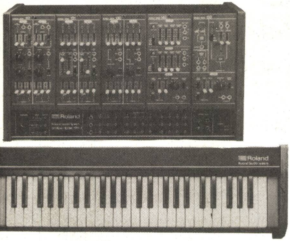
Play and create your own rhythm on the SX-7700G or SX-5E with computer chord accompaniment.

Technics

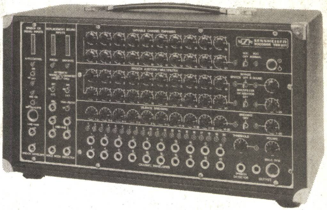
Trade enquiries are welcome!
Please contact . . .
The Manager — Technics Organs,
National Panasonic (Australia) Pty. Ltd.
P.O. Box 319 North Ryde 2113

T2.80

Synthesisers — the new era of electronic music



The Roland System 100M is described by the author as being one of the best small modular systems on the market at this time. It is economically priced, well constructed, and employs modern circuitry. (Roland Corporation (Aust) Pty Ltd, 13 Chard St Brookvale, NSW 2100)



Vocoders divide vocal and instrumental inputs into discrete bands and mix them so that the tone and waveform of the voice is impressed on the sound of the instrument. With a vocoder like this Sennheiser VSM 201, any instrument can literally be made to talk. (R. H. Cunningham Pty Ltd, 4 Waters Rd, Neutral Bay, NSW, 2089)

tive control over the harmonic and volume envelopes of a sound we need add only a device called an envelope generator.

All sounds have a distinctive envelope. The volume envelope of a sound is simply the time it takes to reach full volume, and the time it takes to die away. A bell, for instance, has a sharp beginning (the "attack") and dies away rather slowly (the "decay"). A plucked string has similar characteristics, but if it is damped by placing a finger on it, the decay is much quicker. The envelopes of some common instruments are illustrated.

In practice, it is found that some sounds need two additional parameters to be properly defined — the "sustain" and "release". The piano sound envelope perhaps best illustrates these two aspects.

Synthesisers generally have two envelope generators, one to control the volume, and another to control the cut-off frequency of the VCF. This allows a more realistic sound to be produced, as most sounds have different volume and harmonic envelopes.

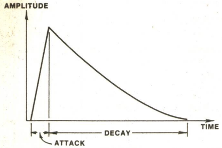


FIG. 1 : PERCUSSIVE ENVELOPE

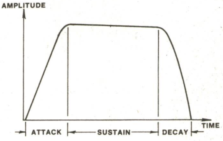


FIG. 2 : VIOLIN ENVELOPE

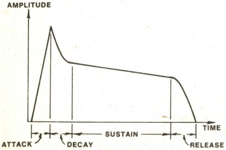


FIG. 3 : PIANO ENVELOPE

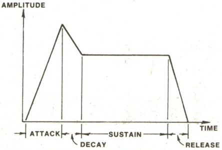


FIG. 4 : GENERALISED SYNTHESISER ENVELOPE

These four diagrams illustrate the sound envelopes of some common musical instruments.

Popular synthesisers

Over the years, synthesisers have evolved into several distinct groups, each aimed at musicians in a different field of playing. When first developed, synthesisers were thought of only in the context of large studios, and their design, size, and cost reflected this fact. The early Moog machines were modular, allowing the user to build up a system of the units that he found most useful. The modules were connected via patch cords.

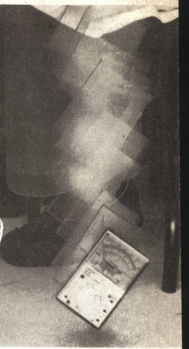
Such systems were inherently slow to set up, and while they did offer the ultimate in flexibility, they were not orientated towards the majority of musicians/composers. Because of this, several manufacturers came out with "budget" modular systems that brought music synthesis within the grasp of the average wage earner. Typical of these systems are the ARP 2600 and the Moog 15, both still available, and offering several VCOs, a VCF, several envelope generators, noise modules, etc — all the basic components of an electronic music system.

A more recent addition to this particular group of synthesisers is the Roland System 100M. Economically priced, well constructed and employing modern circuitry, the 100M is one of the best small modular systems on the market at this time. It is quite adequate for the home studio synthesist and composer.

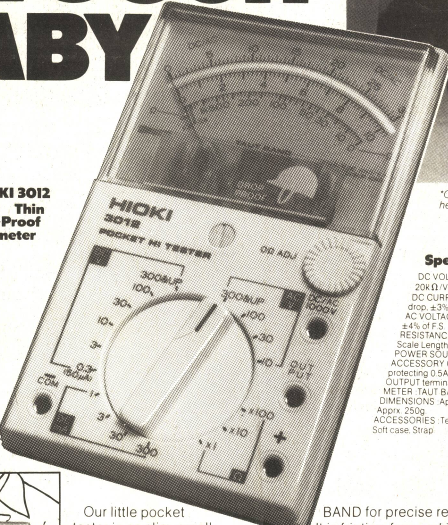
For the more adventurous (and well financed) musician, Roland also offers

Another innovation from Hioki

MEET A TOUGH BABY



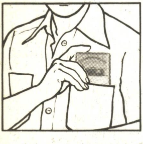
*Only 22mm thick and can drop from a height of 1 metre without any harm.



HIOKI 3012
Thin
***Drop-Proof**
Multimeter

Specifications:

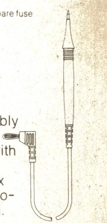
DC VOLTAGE :03, 3, 10, 30, 100, 300, 1000V 20kΩ/V, ±3% of F.S.
DC CURRENT :(50μA), 1, 3, 30, 300mA 300mV drop, ±3% of F.S.
AC VOLTAGE :10, 30, 100, 300, 1000V 10kΩ/V, ±4% of F.S.
RESISTANCE :10k, 100k, 1MΩ (Rc100Ω) ±3% of Scale Length
POWER SOURCE :1.5V (Size AA)
ACCESSORY CIRCUIT: Meter protecting circuit. Circuit protecting 0.5A fuse DC-AC1000V measuring terminal OUTPUT terminal.
METER :TAUT BAND type (with mirror scale)
DIMENSIONS :Approx. 140Hx84Wx22Dmm (Max. 26D) Apprx. 250g.
ACCESSORIES :Test leads, 0.5A Spare fuse Soft case, Strap



Our little pocket tester is so slim, small and light you might overlook the fact that it is a rugged, hard-working precision instrument — tougher than most multimeters twice the size. It can fall from a work bench (1 metre high) and still work perfectly well.

The "DROP-PROOF" pocket multi-meter demonstrates our claim that "HIOKI puts you years ahead". It gives you the advantage of HIOKI Core Magnetic TAUT BAND for precise readings. It is friction-free and is remarkably resistant to shock.

The pencil type leads fittted with guards are a pleasure to handle, especially when testing complex electronic circuits, etc. HIOKI innovation is apparent in every detail.



HIOKI PUTS YOU YEARS AHEAD!

• SYDNEY 6016600 • MELBOURNE 3296511 •
• BRISBANE 525231 • ADELAIDE 466411 • PERTH 4466622 •

H. ROWE
& CO. PTY. LTD.

SOLE AUSTRALIAN AGENTS

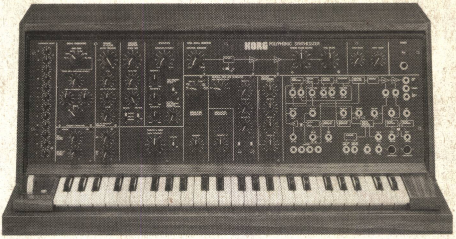
the System 700, a contemporary studio system with many added features.

The performing musician requires a different type of machine. In a live situation, or a professional studio, the accent is on portability, simplicity, ease of operation, and most importantly, playability. This is an area of musical synthesis where personal taste nearly always takes precedence.

Several machines stand out, however, as being particularly suited for live work. The Minimoog is one. This was one of the first small synthesisers on the market, and it is still extremely popular. It contains just the basics (three VCOs, VCF, VCA, contour) but it is an extremely expressive instrument with a unique sound.

The ARP Odyssey, another "old favourite", offers many features not found on the Minimoog, and is slightly more stable in pitch. Both of these instruments are somewhat dated, however, and later synthesisers, especially Japanese models, seem to offer more features, although usually at the expense of quick and easy operation. Two Japanese examples are the Yamaha CS-30 and the Roland SH-7.

For the home organist, the requirements are different yet again. The organist, busy already with the various stops on his instrument, has even less time than the live musician to fiddle around with knobs and switches. The preset synthesiser has evolved to fill this need. It relates to the organist in a language he already understands — the tab switches, used to select voicings and footages.



The Korg PS-3100 polyphonic synthesiser is one solution to the problem of playing notes simultaneously. It has a separate VCO, VCF, VCA and Envelope Generator for each of the keys of the keyboard. (Farrells Total Music Pty Ltd).

Presets usually combine a variety of conventional instrument settings — such as violin, piano, tuba, banjo, etc — with a selection of purely synthetic sounds, such as wow, wind and surf, and the like. Usually, provision is made for modifying the sound in some way, although this may only extend to variation in VCF cutoff, and portamento (glide).

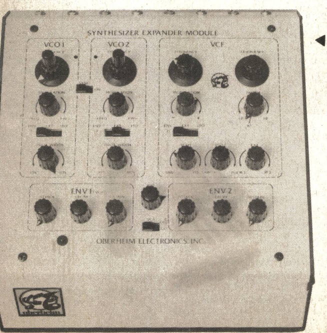
The ARP Pro-Soloist and the Roland SH-2000 are the most popular of the preset models available, offering over two dozen separate settings with adequate control over a variety of parameters.

Polyphonic synthesisers

Despite the remarkable properties of the abovementioned synthesisers, all are beset by one major disadvantage — they can only play one note at a time. This is due to the fact that synthesiser keyboards are made up of a resistor chain that is tapped at a certain level when a key is pressed.

Several half-way attempts to solve this problem have been made, notably in the ARP 2600, Odyssey, and the Roland System 700 and SH-7. These have two-note capability, or to use the correct term, they are duophonic. From the keyboard player's point of view, however, two notes are only slightly better than one.

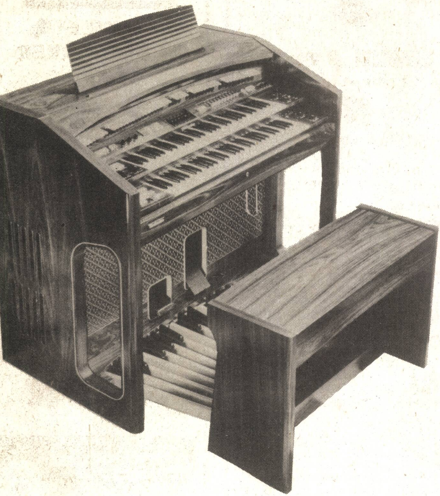
Designing a synthesiser to play chords is no easy job; there are two basic methods, and both are costly.



LEFT: The Oberheim Synthesiser Expander Module is a complete synthesiser voice module and the basic building block of Oberheim's polyphonic synthesisers (Orbital Music Pty Ltd).

BELOW: The aptly named Micromoog is the most compact and affordable Moog synthesiser. (Farrells Total Music Pty Ltd).

Synthesisers — the new era of electronic music



This new Technics SX-5E organ combines traditional organ voices with a huge array of modern electronic facilities, including a programmable chord computer and programmable rhythm computer. Also accessable via the upper manual is a synthesised harmoniser which allows the creation of unique musical sounds outside the range of the normal tab/drawbar/percussion/vibrato resources. The SX-5E retails for $9970 but comparaable facilities are available on the SX-7700G spinet model, which sells for $4995. The range extends through progressively simpler instruments to the SX-1800 at $995. Organs bearing the Technics brand name are gradually displacing the "National" range. (Details from Technics Organs, National Panasonic Aust. Pty Ltd, 95-99 Epping Road, North Ryde, 2113).

First, one can simply(!) provide a separate synthesiser for each note of the keyboard and arrange for them all to be controlled by a common set of panel controls. This was the design philosophy behind the Polymoog, developed by Dr David Luce for the Moog company.

He used a custom manufactured IC containing a VCF, two VCAs, and two contour (or envelope) generators. Although the Polymoog literature describes this approach as a "synthesiser under every key", this is only partly true, since the actual waveforms are derived from a master generator and divider system similar to those used in electronic organs. This master generator is controlled by a VCO, but there is no individual VCO for every note.

To the player, this makes little difference; the Polymoog provides full polyphonic capability — all 72 notes can be played simultaneously (if the mood so takes you).

The Oberheim company opted for a different approach. They use a digitally scanned keyboard and a number of individual voice modules (either four or eight, depending on the model). As notes are pressed on the keyboard, the appropriate control voltages are routed to the voice modules.

The system has several advantages over the Moog approach. Most importantly, each voice module can be set up for a different sound. This allows the performer to orchestrate his playing by employing complementary tone colours in different registers.

Microprocessor control

The advent of microprocessors has made life much easier for the synthesiser designer. Their ability to access large amounts of data quickly and at low system cost has led to a new generation of synthesisers.

Two products in particular are worthy of mention: the Prophet 5 by Sequential Circuits and the MC-8 MicroComposer by the Roland Corporation.

The Prophet 5 is perhaps the ultimate in polyphonic synthesisers. Not only can it play up to five notes simultaneously, which is generally enough for most applications, but all front panel controls are under microprocessor control, and this includes a 40 voice memory. You simply set up a sound on the instrument's front panel and press the record button. The setting is then written into the memory, to be recalled again when required. A memory backup battery with a life of over 12 months is included to preserve memory content between power points.

The MC-8 puts the microprocessor's abilities to another completely different task; it is a digital music composition machine. Up to eight synthesiser voices can be controlled from the MC-8, which provides control voltage and gate outputs for all channels. The notes of the keyboard are simply represented by numbers from one to 255 and stored in a random access memory (RAM). Note timing and rests are also determined by numbers, relative to a fixed timebase which is included in the initial setting-up procedure.

Roland has recently released a compact, single channel companion to the MC-8, dubbed the SQ-100, which retails for under a thousand dollars, and this should fill a gap in the market.

All in all, the next decade should see some interesting improvements (and, hopefully, innovations) in electronic music machines. With the help of the microprocessor and advances in memory technology, the musician/composer should be provided with better tools with which to achieve his goals.

The author would like to thank Farrells Keyboards, 505 Pittwater Rd, Brookvale for their assistance in compiling this article.

TRY THIS EXCITING HOBBY!

Build your own organ . . .
No special skill required

WITH

Catalogue $3.00. 104 pages in colour.
(Refundable on $50 order).

Klaus Wunderlich demo record. Music only with jacket notes $7.00 incl postage.

WERSI Organ Kits

7 Different Models

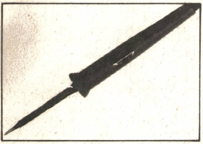
PLUS

- *STRING ORCHESTRA
- *ELECTRONIC PIANO
- *BASS SYNTHESIZER
- *WERSIVOICE ROTOR SOUND

All available from:

CLEFTRONICS PTY LTD
9 FLORENCE STREET, BURWOOD, VIC 3125
Telephones: (03) 288 3034, (03) 288 7899

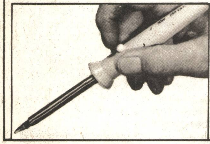
For precision soldering.
Light weight. High power.



ADCOLA STANDARD
No frills.
Just high performance.
3mm S 30
5mm S 50

Fitted with non-seize tips

Fully automatic 'THERMATIC' also available.



ADCOLA DUOTEMP
Temperature control at your fingertips.
3mm D 30
5mm D 50

FROM YOUR RADIO PARTS SUPPLIER OR:
(02) 709 5293
(03) 543 5122
(002) 34 2233
(07) 44 0131
(08) 42 6655
(09) 381 5500

SD2A

ADCOLA

etone
LOUDSPEAKERS

COMPLETE LOUDSPEAKER SERVICE

P.A.
MUSICAL INSTRUMENT
HI-FI
SPEAKER KITS
CROSSOVERS
ENCLOSURE DESIGNS
SYSTEMS ADVICE
SPEAKER REPAIRS

Importers & distributors of

EMILAR

H.F. drivers & horns.

RCF NSW distributors of
H.F. drivers & horns

Perreaux
ADVANCED SOUND EQUIPMENT
audibly superior

Details from:

ETONE PTY. LTD.
53 Stanley Street,
Peakhurst, N.S.W. 2210.
Phone: (02) 534 3569,
534 1353.

STORED PIPE ORGAN WAVESHAPES ... DIGITAL FREQUENCY (PITCH) GENERATION NO PHASED LOCKED OSCILLATORS ... NO DIVIDE BY TWO FREQUENCY GENERATORS DIGITAL CIRCUITRY MULTIPLEXES KEYBOARDS FOR ULTRA RELIABILITY.

Allen DIGITAL COMPUTER ORGAN

IS IT ANY WONDER THAT THE ALLEN, WHICH IS THE ONLY DIGITAL COMPUTER ORGAN DESIGNED FROM THE GROUND UP, IS THE LOGICAL CHOICE OF THOSE IN THE KNOW? ARRANGE TO HEAR AN ALLEN. BE CONVINCED OF ITS AUTHENTICITY OF VOICE AND MIND BOGGLING FLEXIBILITY. ONLY A LARGE PIPE ORGAN HAS EQUIVALENT TONAL FLEXIBILITY. (THE ALLEN SPECIFICATION IS STRAIGHT.)

MELBOURNE	ADELAIDE	SYDNEY	PERTH	BRISBANE
(03) 842 5777	(08) 272 8936	(02) 48 3427	(092) 450 3322	(07) 349 1529

COMING SOON!

DICK SMITH'S FUN WAY INTO ELECTRONICS, VOLUME 2

You've seen Dick's Fun Way Volume 1 – now you're ready for something more ambitious. Here it is! With twenty new and exciting circuits to build – each one actually does something useful. If you had fun with volume one, you'll have twice the enjoyment with volume two. It's coming to a Dick Smith store or newsagent/bookseller near you SOON. Order your copy now: the first printing of Fun Way 1 sold out in just ten days!

ALL THIS FOR ONLY $$6.95!

WATCH FOR RELEASE DATE

Cat B-2605

KITS FOR FUN WAY II PROJECTS:

Kits for all the 20 projects in Fun Way II will be available as soon as the book is published. Full details are in our new 1980 catalogue, page 25.

TELEPHONES HAVE GROWN UP!

Tired of the same old telephone? Try these 20th century telephone-related products for a change!*

- IT'S A CALCULATOR!
- IT'S A DIGITAL CLOCK!
- IT'S A PUSH BUTTON DIALLER WITH 32 NUMBER MEMORY!

What an incredible machine! It's a must for businesses, offices, professional people, even the home! Has a huge 32 number memory – just press a button and the number is dialled for you automatically. Really saves your precious time! Plus you get a 6 digit highly accurate clock (time your STD & ISD calls!) and a superb memory calculator. It's a bargain!

179.00

LIMITED STOCKS!

Cat X-1176

HANDS OFF!

You've seen them in the movies: now they're here in Australia. Great for hands-off use, or more private conversations. Features push-button 'dial' with last number recall, high/low volume (with touch sensors) and modern, easy-care styling. Imagine how this would look on your office desk – or at home!

VALUE!

Cat X-1177

$99.00

PHONE CABLE

Want to do some wiring? Not just for telephones, this cable is ideal for intercoms, burglar alarms, data lines, etc. It's exactly the same as Telecom use. Choice of 4 or 12 conductors, each separately insulated, tinned solid copper for easy soldering or screw connections. PVC sheathed.

4 CONDUCTOR

Cat W-2120
45¢/metre or 35¢/m for 100m

12 CONDUCTOR

Cat W-2140
75¢/metre or 60¢/m for 100m

*Please note: Although these devices are completely compatible with the Australian (Telecom) phone system, with no soldering required, present regulations do not allow them to be used for this purpose.

BARGAIN!

Now a new and bette model of our famou 'Communicator' VH Radio (over 8000 sold!

Tune in to the exciting worl 'upstairs' – VHF! This migh radio has 6 bands, tunes AM FM bands plus 4 others. And includes FREE, a VHF listenin guide.

- 6 bands!
- AC/DC power!

ONLY **$59.00**
Cat D-2833

Calling micro enthusiasts

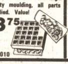
Building computer oriented projects? You'll need a keyboard sooner or later. This deluxe keyboard features individually switched keys with removable tops (comes in standard 'QWERTY' format) with gold plated contacts. Full 63 set ASCII characters.

Cat X-1180 **$55.00**

Need a digital keyboard?

A huge number of interesting projects can be made with a numeric keypad – here's one that you assemble yourself and so save even more! High quality moulding, all parts supplied. Value!

$3.75



Cat K-2010

1980 ARRL H'BOOK

15.95

The all-new 1980 ARRL 'bible', 'The Radio Amateur's Handbook', is now available. With new sections, new data and new features, this is one volume that every amateur and aspiring amateur should have. Cat B-2218

CODE-MASTER

A game of skill & intelligence!

$29.50

Cat X-1140

How's your intelligence and power of logical thinking? This remarkable game will test you to the limit – and gives you fun and enjoyment at the same time. 'Codemaster' is its name; beating you is its game. Are you good enough to beat it? Find out!

SCOOP!

~~$30.80~~

$12.50

A famtastic special scoop buy (really should be one of our bonza bulk buy bargains!) 240 volt motor for models, fans, etc, has three speeds, silent running, is beautifully made and is yours for less than half original price. Brand new, never used – just think of the uses for a motor like this one! Cat M-9900

NEW!

LCD CLOCK/TIMER/ALARM/STOP WATCH MODULE WITH HUGE 8mm LCD DIGITS!

AS USED IN APRIL E.A.

Incredible sophistication! This composite 7 channel digital clock and timer module operates from a single 1.5 volt penlite cell; can be used for a huge range of time and timer projects. Complete on one pcb, data supplied with unit. Cat X-1050

$17.50

OWN A YAESU?

$3.95
Cat D-9050

Protect your valuable investment with this smart PVC cover. Fits most 'square finish' Yaesus (eg FT101, 901, etc). Cheap insurance!

MORE OF DICK'S BONZA BULK BUY BARGAINS – BEWDY!

SAVE!

SAVE 33% ON 9V EVEREADY BATTERIES

Yes, a huge reduction. R.R. price is 89¢ each: our price on this 'bulk buy' special:

60¢!!!

Cat S-3106

UHF RIGHT ANGLES:

This is more an 'oops' than a bulk buy. We over-ordered: you save by our mistake. Were selling for almost $3.00 Now look at the price! Great for tidying up shack wiring. Cat P-2382

$1.50

Mains cord & plug

How's this one: over 1 metre of 3-core mains cable complete with moulded 3-pin plug, ready for wiring into all types of mains projects. Colour coded wire so you can't go wrong.
Cat W-2058

was $1.40; NOW 90¢!!!

NEW! INCREDIBLY LOUD AUDIO ALARM

You've got to hear this to believe it! It's ear shattering! Nominally rated at 9 volts, operates from around 5 to 25 volts.

Cat L-7024 **$4.95**

SPEAKER FADER

High power (25W) control for fading between front and rear speakers. Easy to fit, a delight to use! Cat A-7834

$9.95

NEW!

FM WIRELESS TIE-CLASP MIC

Here's a brilliant idea: a tiny tie-clasp condenser microphone complete with miniature FM transmitter: receive it on any standard 88 to 108MHz FM receiver. Transmitter section is small enough to slip into shirt pocket; mic comes complete with tie bar. A great idea for entertainers, demonstrators, public address, etc etc etc.

$29.95
Cat C-1073

25-IN-1 EXPERIMENTS

$16.95

Cat K-2032

Here's one for the kids (and maybe the not so young!) An experimenter's kit featuring the latest field of electronics, solar power. Learn more about this fascinating field with these 25 projects – all in one handy package.

We've got some more Pocketcoms!

Just when we thought no more! Over 20,000 sold in a hectic 6 weeks before Christmas. Now we've located some more – but these are definitely the last! Incredible value: were selling for almost $60.00; our price less than ¼ that! Comes with one channel fitted (27.125MHz); 2nd channel left open. Batteries available at our stores. (Cat S-3005, 25¢)

Cat D-1100
$14.50

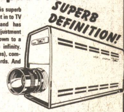
INCREDIBLE! Low cost TV camera with RF AND video output . . .

SUPERB DEFINITION!

Compare: and be amazed! This superb b&w TV camera feeds straight in to TV set (video output also), and has unique mechanical vidicon adjustment for extra close focussing (down to a miniscule 15mm!) or up to infinity. High resolution (over 550 lines), compatible with Aust TV standards. And the price: a bargain!

Cat X-1195

$299.00



AS REVIEWED IN APRIL EA

Make a cheap CCTV system

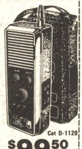
Use the above camera in conjunction with our b&w TV set for a superb quality closed-circuit TV system. Great for all sorts of monitoring uses: pools, visitors, security applications, etc etc – the uses are endless! And compare the price of this system with comparable CCTV systems! (You can still use the TV as a TV if you wish!) Cat X-1198

$99.00

6 CHANNEL SAFETY TWO-WAY

What a bargain! This deluxe marine transceiver features 6 channel capability; (1 channel comes fitted with 27.88MHz safety & distress freq.) and features huge 5 watts input (maximum legal power).

Why take chances when for so little you can equip your boat with two-way radio. And you take it with you when you're ashore – so it can't be stolen! It's one of the best boating investments you can make.



Cat D-1120

$99.50

NEW CHANNEL XTALS

Yes we're stocking crystals for the new 27MHz marine channels: fit them to your transceiver to make sure you'll be heard!

27.860MHz (D-6086)
27.940MHz (D-6094)
27.960MHz (D-6096)

Stocks due next month –

$5.00 pair

OLD ROCKS:

Of course, we'll continue to stock the crystals for the present 27MHz marine channels:

AM/FM/SW CASSETTE HUGE 3W O/P!

Wow! What incredible value! A superb quality cassette radio with AM, FM, plus SW for under $80.00!! It operates from both 240 volt mains plus internal batteries (not supp.) and features an inbuilt microphone plus extension mic jack. A 'sleep' feature is incorporated (turns off after you go to sleep at night!) This radio was personally selected by Dick recently as being best value for money. For those who want quality, here it is:
Cat A-4016

$75.00

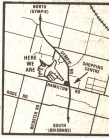
INCREDIBLE!

2 NEW STORES!

NOW OPEN – OUR SECOND STORE IN BRISBANE . . .

Now for all the people on Brisbane's northside, you won't have to travel through the city! Our new store is right opposite the Chermside shopping centre. Same friendly service, same range of quality products as our Buranda store: but much more convenient!

**842 Gympie Road,
Chermside.
Phone 59 6970**



OPENING SOON:

Our 6th Sydney store – at 613 Princes Hwy, Blakehurst. Watch for the opening date!

MAJOR DICK SMITH RESELLERS

Listed below are re-sellers who stock a large range of our products. However, we cannot guarantee that they will have all items in stock or at the prices we advertise.

ADVANCED ELECTRONICS
5a The Quadrant, Launceston, Tas. (317 075)

AERO ELECTRONICS
123a Bathurst Street, Hobart, Tas. (348 232)

AMATEUR'S PARADISE
121 Nerang Street, Southport, Qld. (322 644)

A & M ELECTRONICS
78a High Street, Wodonga, Vic. (244 588)

COASTAL ELECTRONICS
43 Vulcan Street, Moruya, NSW. (742 545)

CRYSTAL TV RENTALS PTY LTD
66 Crystal Street, Broken Hill, NSW. (6897)

DECRO ELECTRIC
Cnr Magellan St & Bruxner Hwy, Lismore, NSW. (214 137)

ELEKTRON 2000
181 Wharf Road, Newcastle. NSW. (262 644)

ELECTROFIX
133 Malop Street, Geelong, Vic. (97 827)

GOODWIN ELECTRONICS
123 Station Street, Blackheath, NSW. (878 379)

HAWKESBURY ELECTRONIC CENTRE
111 George Street, Windsor, NSW. (773 441)

HITEL HI FI
145 Queen Street, St Marys NSW. (623 4442)

D & M HARRINGTON
6/1 Machinery Drive, Tweed Heads South, NSW. (364 589)

HUNTS ELECTRONICS
18 Neil Street, Toowoomba, Qld. (326 944)

HUTCHESSONS COMMUNICATIONS CENTRE
5 Elizabeth Street, Mt Gambier, SA. (256 404)

KELLER ELECTRONICS
218 Adelaide Street, Maryborough, Qld. (214 559)

KINGSTON ELECTRONICS & RECORDS
Channel Court, Kingston, Tas. (296 802)

KB ELECTRONICS & MARINE
361 Main Terrace, Geraldton, WA. (212 176)

KENT ELECTRONICS
42 Stuart Highway, Darwin, NT. (814 749)

LYREBIRD ELECTRONICS
50 Berry Street, Nowra, NSw. (25 525)

MELLOR ENTERPRISES
Shop 2, Forsythe St, Whyalla Norrie, SA (454 764)

M&W ELECTRONICS
48 McNamara Street, Orange, NSW. (626 491)

NAMBOUR ELECTRONIC SHOP
Shop 4, Lowan House, Ann St, Nambour, Qld. (411 604)

ODYSSEY ELECTRONICS
101 Main Street Bairnsdale, Vic. (525 262)

POWER'N'SOUND
15 Franklin Street, Traralagon, Vic. (743 638)

P.J. O'BRIEN ELECTRONICS
62 Wee Waa Street, Walgett, NSW. (243)

PURELY ELECTRONICS
15 East St, Rockhampton, Qld. (21 058)

SUMNER ELECTRONICS
95 Mitchell Street, Bendigo, Vic. (431 977)

STEVENS ELECTRONICS
42 Victoria Street, Mackay, Qld. (511 723)

SILICON CHIP ELECTRONICS
Suite 3, 98 Bridge Street, Muswellbrook, NSW.

TABLELAND RADIO SERVICE
2 Jack Street, Atherton, Qld. (912 017)

TOMORROWS ELECTRONICS & HI FI
68 William Street, Gosford, NSW. (247 246)

TRILOGY WHOLESALE ELECTRONICS
40 Princes Hwy, Fairy Meadow, NSW. (831 219)

TROPICAL TV
249 Fulham Road, Vincent, Qld (791 421)

WAGGA WHOLESALE ELECTRONICS
82 Forsyth Street, Wagga, NSW 2650

VIKING ELECTRONICS PTY LTD
3108 Gold Coast Hwy, Surfers Paradise, Qld. (388 280)

BUYING BY MAIL?

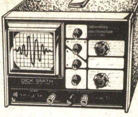
It's so easy! Simply list the items you want, with their catalogue numbers, and post it off with your cheque to our mail order centre (address at right). Don't forget to include post & packing (charges apply to total order value as per table at right).
Then watch your letterbox!

ORDER VALUE:	P&P
$5 (min) to $9.99	$1.00
$10.00 to $24.99	$2.00
$25.00 to $49.99	$3.00
$50.00 to $99.99	$4.00
$100 or more	$5.50

NOTE: These charges apply to goods sent by post in Australia only. Large and bulky items cannot be sent by post.
If you prefer, we will despatch your order by Comet Road Freight to anywhere in Australia for only $6.00 – that's below what it costs us! Large and bulky items are normally sent by Comet unless you specify differently (eg by rail or air – you pay freight on delivery.)

IT'S HERE!!!

AND IT'S EVEN BETTER THAN WE'D HOPED!



Yes, stocks have arrived of our fabulous new Dick Smith Laboratory Oscilloscope. We were expecting a 5MHz cro – these have a response in excess of 6.5MHz!! Everything about these smart looking units says 'quality!'
Now there is no excuse for everyone in electronics – from the service technician to the student – not to have their own cro. Imagine how much easier repairs, service work, developmental work, circuit monitoring, studies, etc become with a cro of your own. Just look at these features:

- **Bandwidth: More than 6.5MHz**
- **Sensitivity: 10mV/division**
- **Sweep Frequency: 10Hz – 100kHz**
- **Screen size: 75mm**
- **Sync: Internal and External**

ALL THIS FOR ONLY $199.00

Cat Q-1280

TRS-80 OWNERS:

Check this book out: over 75 programs for everyday usage: interest, depreciation, algebra & calculus, statistics, etc. An incredibly useful work!

$9.95

Cat B-2345

AND NOW: A CASSETTE!

Yes, save hours of work. All the programs in the above book already on cassette. It'll be at your store this month:

$19.50

Cat X-3665

DON'T THROW 'EM OUT: CHECK 'EM FIRST!

Trouble with batteries is you never know if they're any good. You can't measure them with a meter; so you throw them out. Here's the answer: a battery checker that takes virtually all batteries (even Nicads, etc), loads them properly and gives you a yes/no/marginal reading. Every home should have one!

$9.95

Cat Q-1525

SPEAKING OF BATTERIES

NiCads are cheaper!

It's a fact: Nicad batteries work out far cheaper in the long run. they may be dearer at first, but if you work out the price vs. number of charges, you'll agree. Penlight Nicads are ideal for replacing conventional 'AA' cells. (1.2V is normally close enough).

Only $2.05 each
Or $1.80 ten or more.

Cat S-3300

PROGRAM TAPES:

Use your home computer to advantage with these tapes:

FOR THE SORCERER:		
YAHTZEE	(Cat X-3600)	$9.95
BLACKJACK	(Cat X-3602)	$9.95
WUMPUS	(Cat X-3604)	$9.95
FOR THE TRS-80:		
TIME TREK	(Cat X-3650)	$17.95
STIM. SIMULATIONS	(Cat X-3652)	$17.95
ELECT. PAINTBRUSH	(Cat X-3654)	$17.95
BRIDGE CHALLENGER	(Cat X-3656)	$17.95
MICROCHESS 1.5	(Cat X-3658)	$22.95

COMPARE OUR PRICES WITH THEIRS!

DEAR CUSTOMERS . . .
Quite often, products we advertise are completely sold out within a few days. Or problems may hold up delivery of promised goods so they are not in the stores when the advert appears. Please don't blame the store manager or staff: they are powerless to do anything about it! What we are trying to say is that, if you are about to drive across town to pick up a particular line, give the store a ring first . . . just in case!

Dick Smith and Staff

SAVE YOUR CAR BATTERY

$4.50

Cat A-8509

How many times have you returned to your car only to find you've left your lights on and . . . flat battery. It need never happen again! This superb little alarm attaches in seconds with just two wires, sticks underneath your dash and beeps if you leave your lights on. (Just in case you **want** to leave them on, it stops after 10 seconds.) Incredible? We think so! And just look at the price – isn't that worth saving your battery – just once?

Can't charge Nicads? Problem solved!

This great new Nicad charger cartridge from A&R plus our multi-voltage adaptor – you're in business. Simply place 2 to 4 Nicads in the cartridge, plug in the adaptor and you're away. Come back in 15 hours and they're fully charged!

PLUG-PACK ADAPTOR
$9.50 Cat M-9525

CHARGING CARTRIDGE
$1.95 Cat M-9518

Hobbyist drill goes anywhere!

Ideal for printed circuit boards, most wood, plastic & other hobbyist jobs. Runs from two 'C' cells (extra) comes with 1mm drill & tommy bar.

Cat T-4750 **$17.50**

SEAL IT!

Silicon sealant is ideal for sealing projects where water might be a problem. (CDI's, TV amps, etc). Handy size tube for the hobbyist: also great for repairs to fishtanks, etc. Handy!

Cat N-1225 **$3.95**

DISCOLITE

- **It's a strobe!**
- **It's a music colour!**
- **It's a light dimmer!**

This is the most incredible device going. It is three in one: a strobe circuit which flashes incandescent globes in a pseudo-strobe effect; plus it's a colour organ which has its own inbuilt mic. to modulate lights in accordance with music or sound received; plus it is a conventional light dimmer. All you do is plug it into the power point, and plug your lights into it. It really is incredible!

Cat X-1105 **$47.50**

PLUG-IN TIME SWITCH

Incredible! Up to 3 on/off actions per 24 hours, fully settable, auto and manual control. Contacts rated at 2400 watts (same rating as your power point); appliances simply plug in! Pool filters, security lights, battery chargers, electric blankets, etc etc etc. Auto or manual control, too.

Cat X-1120

24.50

AMATEUR POWER!

Want to build HF/VHF amplifiers? Try these superb RF power transistors from Dick. Three different ratings for various outputs, up to a massive 80 watt brute! Rugged, reliable & economical. (All 18V V_{CE} & 36V V_{CB}

Type	Cat No.	I_C	P_{TOT}	Price
2N5590	Z-2390	2A	30W	$8.48
2N5591	Z-2391	4A	70W	$13.95
2N6084	Z-2394	6A	80W	$17.95

BARGAIN 12 VOLT CLOCK MODULE

This has to be the bargain clock of the decade! It's a full fluorescent display with large bright green digits (ideal for daylight use) complete with alarm (buzzer fitted) Runs off 12 volts, with 'inhibit' line for battery saving. Incredibly accurate (quartz crystal timebase); great for building into cars, boats, planes, etc etc.

Cat X-1045

WAS $19.50

NOW $14.50!!!

WHAT A SAVING!

AMATEURS

Don't forget: Dick Smith will better any genuine Australian advertised price on Yaesu!

For us to better any price, simply bring along a copy of the current advert from a dealer in the same city. After checking they have stocks to sell at that price, we guarantee to better it!

PROBABLY YOUR LAST CHANCE!

You've heard all about the effects of inflation and depreciating exchange rates on the prices of overseas goods. Electronics is no exception: and CB radios have also had to bear the impost of a 30% duty!!! The net result of all this is that once our current stocks of CBs are sold out,

PRICES MUST RISE!

We bought huge stocks of CB in pre-duty & pre inflation days. These stocks have now just about run out – so if you were putting off buying a CB until the prices came down, think again. You may just miss out!

ABOVE: Midland 76A 886
Was $199.50, Now only
$129.50
Cat D-1438

Cat D-1437
Midland 77A 963.
Was $179.50 . . .Now only $129.50

MINI ALARM CLOCK

Never pay another parking fine or miss an important appointment!

WAS $29.00

What a special! Tiny alarm clock fits into shirt pocket or purse, can save you a fortune in parking fines alone! We've knocked almost $5.00 off the price, too: save money now and later!

Cat X-1042

NOW $24.50

REFERENCE DATA FOR RADIO ENGINEERS
ITT

NEED DATA?

This is the best!

Incredibly valuable reference work for anyone involved in electronics, from beginner hobbyist through to a-hundred-letters-after-his-name engineer. Huge 1196 pages, hard cover.

Cat B-1104

$35.00

BUILD A KIT:

It's FUN and a great way to learn and save money too!

MORSE KEYER

For all hams or would-be-hams! This kit includes paddle & all components, inc. case (panel is not marked). Variable speed in correct proportion, inbuilt oscillator. Suits most transceivers.

Cat K-3470

$39.50

ETI 300W AMPLIFIER

More power for your dollar! Massive 300W; ideal for groups or serious audiophiles. Kit for complete module, as shown.

$69.00 Cat K-3444

DISCO STROBE

Turn a dull party into a disco with this one! Bright, vibrant flashes from easy-to-build kit. Can be added on to for even more output. We've sold thousands of this one!

Cat K-3152

$34.50

DIGITAL FREQUENCY METER

Great for the hobbyist or technician. Basic version measures to 40MHz; goes to 200MHz with one extra IC. 7 digit display.

Cat K-3437

$99.50

25W CAR STEREO BOOSTER

Road noise beating you? Up your car stereo ouput to a massive 12 watts per channel. Easy to construct, just cuts into speaker leads for an incredible difference in listening enjoyment.

Cat K-3493

$29.50

12 VOLT POWER SUPPLY

How many projects need a 12 volt supply? Most! Or run car radio, stereo, CB, etc on the bench. No hobbyist should be without one of these valuable supplies: 12V @ 3A.

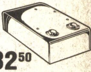
Cat K-3448

$29.50

CD IGNITION

Our best selling ignition kit. Comes with pre-wound transformer (all the hard work is done for you!) and comprehensive instructions making assembly a breeze.
Get better performance from your car with this great kit.

Cat K-3280



$32.50

SEND FOR YOUR FREE COLOUR KIT CATALOGUE

DID YOU MISS OUT?

The 'New Decade' catalogue from Dick Smith Electronics was presented free with last month's Electronics Australia and Electronics Today. If you missed out on your copy, don't worry: there are plenty available from your nearest Dick Smith store or our mail order centre. The price is just 75¢: worth that for the data specifications section alone!.

SEEN OUR RANGE OF HOBBYIST HARDWARE PACKS?

Our hardware packs are designed with the hobbyist in mind. Top quality, in realistic pack sizes to suit the hobbyist: and best of all, you save!

LUG PACK
100 solderless lugs in popular sizes. Crimp-type lugs (can be soldered if required). Plated.
Cat H-1994 . . . $3.50

CLAMP PACK
3 sizes to suit various diam. cables – in packs of five.
5mm: (H-1964) **75¢**
6mm: (H-1965) **80¢**
8mm: (H-1966) **80¢**

SCREW/NUT PACK
Over 200 pieces of popular screws, nuts & washers. Ideal for the serviceman, too!
Cat H-1680 . . . $3.90

BRACKET PACK
6 right angle brackets – ideal for mounting PCB's on chassis, etc. 12mm long, 3mm clearance.
Cat H-1895 . . . $1.75

SCOTCHLOK PACK
Pack of 2 handy cable joiners – no stripping or cutting; just apply and squeeze with pliers.
Cat H-6720 . . . . . 50¢

SPRING PACK
Between 150 & 200 springs of various types (compression & tension) in various sizes.
Cat H-1690 . . . $2.95

FEET PACK
Pack of 8 rubber feet, can be screwed or glued on (3mm dia hole). Ideal for all projects.
Cat H-1736 . . . . . 75¢

PCB STAND PACK
Holds printed circuit boards off chassis, firmly & securely. Snap into place. Pack of 6, 9mm long
Cat H-1981 . . . . . 80¢

TO-3 PACKS
Insulating washer and 2 bushes to suit TO-3 transistors. Pack of 4 insulating kits.
Cat H-1917 . . . . . 65¢

GROMMET PACKS
3 sizes, essential for safety. 10 in smaller sizes, 8 in 12mm.
8mm (H-1712) **80¢**
16mm (H-1716) **80¢** 12mm (H-1719) **80¢**

LED BEZEL PACKS
Pack of 15 bezels to take standard size LEDs. Push fit into hole, LEDs push in. Black.
Cat H-1910 . . . . . 75¢

DON'T FORGET: We also have a large variety of packs containing nuts, bolts, washers, etc. They're at your nearest store!

DICK SMITH ELECTRONICS

NSW
125 York Street, SYDNEY. Ph 290 3377
147 Hume Highway, CHULLORA. Ph 642 8922
162 Pacific Highway, GORE HILL. Ph 439 5311
30 Grose Street, PARRAMATTA Ph 683 1133
396 Lane Cove Rd, NORTH RYDE Ph 888 3200
263 Keira Street, WOLLONGONG. Ph 28 3800
613 Princes Highway, BLAKEHURST (Opening Soon)

VIC
399 Lonsdale Street, MELBOURNE. Ph 67 9834
656 Bridge Road, RICHMOND. Ph 428 1614

QLD
166 Logan Road, BURANDA. Ph 391 6233
842 Gympie Road, CHERMSIDE. Ph 59 6970

ACT 96 Gladstone Street, FYSHWICK. Ph 80 4944
SA 60 Wright Street, ADELAIDE. Ph 212 1962
WA 414 William Street, PERTH. Ph 328 6944

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113. Ph 888 3200. PACK & POST EXTRA.

bankcard
welcome here

SHOPS OPEN 9AM to 5.30PM
(Saturday: 9am till 12 noon)
BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY
RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

Wersi

Build-it yourself

Wersi Organ Kits from Germany offer the do-it-yourself person an excellent opportunity to obtain a first class electronic organ at around half the price of an equivalent factory-built model. Comprehensive instruction manuals make the task a pleasant one and ensure a successful outcome, even though the builder may have little knowledge of electronics.

by IAN POGSON

The name "Wersi" will be new to most readers. Although the company started in a modest way in Germany more than a decade ago, it has been represented in Australia for only a few years. In that short time, however, by virtue of the quality of the product, Wersi organ kits have created a great deal of interest among organ enthusiasts.

In addition to the "do-it-yourself" attraction of building a Wersi electronic organ, the builder may choose from a range of models and options. Each model is built up from a number of kits, either purchased together or one at a time as each preceding kit is completed. Once the basic model has been assembled, the builder can then add the various other features, depending upon his requirements and his budget.

He may for example, choose to omit the rhythm unit or some other section he does not want, thereby reducing the overall cost.

An important point here is that although a specific facility has been omitted, it may be added quite easily at a later date, without any problems of interwiring between the existing and the new parts of the instrument.

There are seven models available altogether. They range from a spinet with two 49 note manuals, 13 pedals and one amplifier channel, to a very comprehensive three manual unit with 61 notes and a 30 note pedalboard.

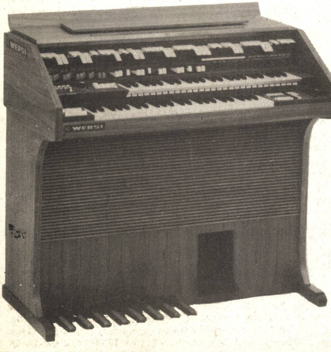
With such a wide range of models available, there should be no trouble in choosing one to suit individual needs. Most models are equipped to meet the needs of light music but at the same time, they are so voiced that they are also able to cope well with liturgical and classical music.

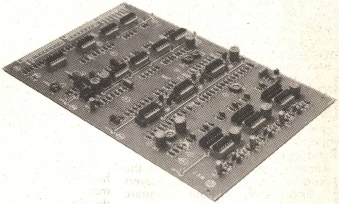
In addition, there is a model designed specifically for liturgical and classical organ literature and this is suitable for use in the home, as well as in public halls and churches.

All models have fixed stop voices in the conventional way and all feature the well known drawbar system on each manual. With both systems, a very wide variety of sounds and effects are available.

While it would take more space than is available to go over all of the features of Wersi organs, I will mention just a few and leave the rest to be gleaned from the catalog by those readers wanting further information.

Without any doubt, the most important feature of any organ is the type of sound which can be obtained





▲ *This assembled PC board is typical of those used in the Wersi organ range. It provides the "Wersivoice" facility, an electronic version of the familiar rotating speaker system.*

◀ *Left: An ideal home spinet, the "Orion WIS" is one of the most popular in the Wersi range. Built with all options, it features auto-rhythm, numerous fixed stops, pedals, drawbars, piano and string orchestra voicing, Wersidata registration memory, Wersivoice rotating speaker effect, and a host of special effects.*

ty organ kits

Flagship of the Wersi range, the "Galaxy W4SKT" combines contemporary styling with an exotic wood finish. As with its lesser brothers it can be built with various options, depending upon the builder's requirements and budget. Technical features include three 61-note manuals, a 30-note pedalboard, and comprehensive voicing, rhythm, accompaniment and other special effects.

from it. In my opinion, Wersi have done an excellent job in this regard. The voices are of a convincing nature and, when subjected to some of the processing available, a very good organ sound is achieved.

Organ pipes are variable in their manner of speech, some being quite fast, others rather slow, with a build-up to the full sound from each pipe as it speaks. Wersi have provided for "envelope" control which allows for either fast or slow attack, as well as fast, medium or slow decay. The two can be set independently and this feature adds somewhat to the realism.

There is no doubt that when one hears an organ in a very large auditorium with appropriate reverberation, such as in a cathedral, the sound can be very grand indeed. The sound, apart from the actual reverberation, seems to "roll" around, an important characteristic of such an environment.

While there is no real substitute for a cathedral or the like, Wersi have gone a significant way towards simulating this sort of sound. They have designed an electronic device, called Wersivoice, which takes the place of the familiar rotating speaker system used in many electronic organs. Both fast and slow speeds are available, the slow speed giving a good simulation of the rolling sound mentioned above.

It should be added that the fast speed of the Wersivoice gives the familiar "theatre organ" sound. The Wersivoice is also capable of adding other effects, including a multiplying effect called "String Choir". All this is obtained without any moving parts and their attendant acoustic noises.

Another noteworthy feature is the Wersidata Sound Computer. Players will know that, without adequate facilities, it is virtually impossible to make extensive changes in registration while a piece is being played. The Wersidata Sound Computer is an easily programmed unit which allows 32 preset registrations, each of which may be called up at the press of one button.

What's more, the computer can be optionally expanded to allow up to 64 presettable registrations.

In addition to the features just mentioned, all Wersi units have electronic keying rather than multiple mechanical key contacts. With the exception of the Classica, all models have a versatile Special Effects section and a very good Rhythm Unit and Auto Accompaniment.

To get back to the concept of kit building, I can comment from personal experience as I am in the process of building the Zenith model. This is a model with two 61-note manuals and a 30-note pedalboard. At the time of writing, it is virtually complete, with only a few loose ends to be tidied up.

Construction has involved about 450 hours of work, spread over about nine months — figures that would vary with the choice of instrument and the speed at which the individual constructor may work. However, the man-hours so invested will be reflected in the final value of the instrument, plus the satisfaction of having assembled it yourself.

When building a complex item of electronic equipment such as this, the question naturally arises as to what happens if one gets into difficulty, or if there is something that one doesn't understand. In fact, the Wersi organisation and its representatives are keen to see that a satisfactory conclusion is reached with each project, and every effort is made to help the constructor through any problems.

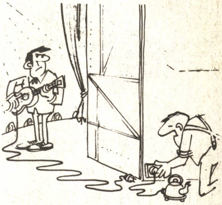
To sum up, the assembled organ has all the appearance and finish of a factory-built instrument, plus voicing and an overall sound which has been commended alike by professional and semi-professional musicians. On a price/performance basis it compares more than favourably with other factory built brands, and this observation would probably hold true for other models in the Wersi range.

Those readers interested in obtaining further information on Wersi organ kits should contact Defi Agency, 9 Florence St, Burwood, Victoria (telephone 03 288 7899). A 104-page colour catalog is available (price $2.00) post paid) as are a number of demonstration records, including one made by the well known German organist Klaus Wunderlich (price $7.00 post paid).

A working musician looks at Stage Amplifiers

Sound equipment used for live performances on stage is very different from the average home stereo system. It has to be rugged, reliable, and capable of operating in extreme conditions. Here a working musician looks at amplifiers.

by ANDREW HILLIAR



The audience sits in stunned silence. Jack Guitar, lost in a world of his own, is searing his way through a climactic, pyrotechnic solo. Tonight he is on top of the world. Tonight he is in tune with his multitude of fans. His solo peaks and . . . silence!

Yes, our hero has just destroyed his long-serving guitar amplifier. His dreams of yet another successful appearance are floating away in a cloud of smoke!

Quite possibly, Jack Guitar has seen a similar disaster strike at other venues, at equally inopportune moments. Indeed, it is a fairly common occurrence, for Jack, like many other aspiring musicians, does not look closely enough at the equipment he has to work with.

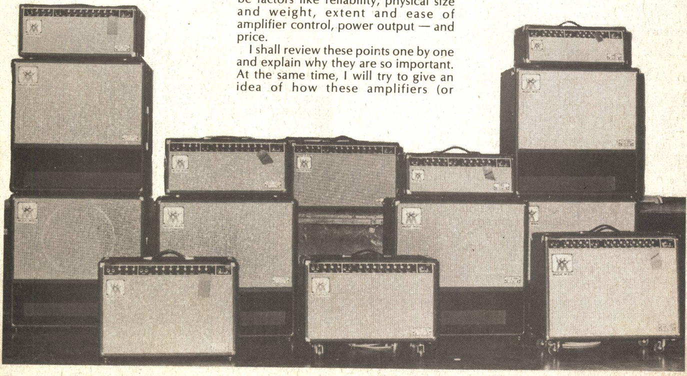
The amplification equipment and other electronic gadgetry used by professional musicians varies widely in terms of performance — from cheap gear that is barely adequate to advanced examples of electronic technology. Because of this I do not intend to delve deeply into the whys and wherefores of amplifier operation. I shall attempt, rather, to give an overview of why on-stage amplifiers are so different from the home music amplifiers, familiar to most "Electronics Australia" readers.

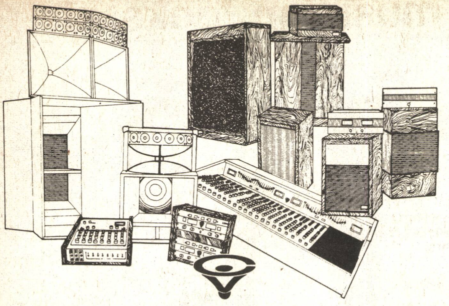
Perhaps based on bitter experience, an established professional musician will typically go to extraordinary lengths to find the amplifier that will meet the requirements for his particular instrument. Figuring large will be factors like reliability, physical size and weight, extent and ease of amplifier control, power output — and price.

I shall review these points one by one and explain why they are so important. At the same time, I will try to give an idea of how these amplifiers (or "Grunge Boxes" as they are sometimes called) differ from the conventional amplifiers in home music systems.

Reliability and size

Reliability in an on-stage situation is critical. Possibly the major reason that amplifiers "blow up" is the handling that they receive. On the job, road crews (or "Roadies") have to be seen to be believed. I hasten to add that this is not a criticism of these hardy souls, for





Cerwin-Vega manufactures a wide range of amplifiers, speakers and special effects units for the performing musician. This line drawing reproduced by courtesy of the Australian distributors Graham Audio Pty Ltd, 144 Brougham St, Kings Cross, NSW 2011.

they invariably have a deadline to meet. Time is money in show business and, the sooner they can load and unload equipment, the happier both they and the musicians are.

Things are dropped, tripped over, and generally given a hard time, which understandably doesn't do them a world of good. This is especially true of valve type amplifiers, which are still very popular. Owners of these are no strangers to a brace of fractured tubes!

Other problems include overdriving and heat dissipation in the output stages of the amplifier. You may have wondered why musicians perspire so freely. If you are ever placed under spotlights (even the smallest of venues generally have them), you will wonder no more. It's hot. It's close. Sometimes it even gets hard to breathe!

It's really tough for the amplifiers in rock bands. These are usually cranked up as far as they can go and, even with considerable heatsinking, the output stages find it hard to dissipate heat into already hot, still air. Consequently, special precautions must be taken against output stage failure.

A stereo amplifier in a modern home system may quite literally work for years without a problem. A stage amp, on the other hand, may not see out one tour of duty, let alone years of heavy work. It is for this reason that they have to be carefully designed and solidly constructed.

And the same remark applies to the in-built speakers.

However there are limits to how far a designer can go in beefing up an amplifier. There is no point in having an indestructible unit if it needs a fork-lift truck to move it. Indeed, some of the best amplifiers on the market are only about 30cm tall. A good example is the Mesa Boogie, one of the new style of small, highly portable (and expensive) amplifiers.

Amplifier controls

Amplifiers come with all sorts of circuitry to make the modern "muso" sound better. Some of the more typical aids are:

- Reverberation — Reverb adds life to flat sounds by means of delay circuitry which extends the normal decay rate of the signal on the input. It gives a defined brightness and depth to the sound that arrives at the listener's ear.
- Distortion — This rather nasty sounding control deliberately overdrives the preamp to effectively clip the input signal. It gives a coarse sound, with a dramatic increase in sustain.
- Tremolo or Vibrato — An oscillation effect, usually accompanied by a speed control to adjust the rate of oscillation. Sometimes a depth control is present, to control the amount by which the vibrato modulates the incoming signal.

Later amplifiers often come equipped with a phasor or, like the Roland JC (Jazz Chorus) series, a chorus effect. The phasor phase shifts the incoming signal continuously to give the effect of sound sliding up and down, trough to crest, through a succession of swells. It sound quite cosmic.

If you have ever listened to a 12-string guitar, you would have some idea of what the "chorus" effect is all about. It sounds as though there is a full orchestra behind the instrument being played!

All amplifiers are fitted with bass and treble controls, and sometimes midrange tone controls as well. Some also have a "brightness" or "presence" control to give more emphasis to higher frequencies. The increased clarity in the middle to high frequencies

RIGHT: The Peavey Backstage 30 is typical of amplifiers in the lower price range, designed for home or rehearsal use rather than hard-driving rock concerts. It is a combination unit with an output of 18W, and incorporates a 30cm speaker and a single channel equaliser. (Australis Instruments Pty Ltd). ▶ ▶

◀ ◀ *LEFT: The "Music Man" range is a good example of the wide variety of stage amplifiers available to the modern musician. It starts with a compact 65W unit and progresses to the 212 HD combination amp with an output of 130W and two 30cm speakers. Amplifiers with built-in effects are also available. (Australis Instruments Pty Ltd, 2 Powells Rd, Brookvale, NSW 2100).*

helps overcome the inherent "muddiness" of many live music situations.

Home stereo amplifiers have no need for these resources (other than tone controls, perhaps) because their role is to reproduce existing music — not to create a distinctive new sound.

Power

This is probably the most controversial aspect of the stage amplifier. A large number of beginning musos seem to have the mistaken impression that in order to play loudly, you must have a large amplifier. This may be so when playing directly to a relatively small audience. However, in a stage situation, instrument amplifiers are commonly fed via a mixing desk to the power amplifiers and speaker stacks of the PA, which provides all the power necessary to cover the audience with the appropriate sound mix.

In the world of jazz, which is generally played in smaller areas, power is used mainly for clarity of sound rather than "audience rending" volume. The type of music that you play determines the amount of power that you need — for jazz, sufficient power for clear, clean, concise sound; for rock, raw power that's "fat" (ie has a lot of punch).

A vital element in the production of sound from the stage is the mixing console. A mixer who is inexperienced can have an unbelievably damaging effect on the performance. He is responsible not only for the volume and tone of the sound that reaches the audience, but also for the sounds fed back to the musicians via the stage monitors.

For instance, just a short time ago when our band was playing we had a novice mixer. I should have been getting bass through my monitor, to keep everything nice and tight. Instead, somehow, I was getting my own drum kit with echo, which was rather confusing to say the least. A musician's life is not always a happy one!

Price

It is a well known fact that your average musician seldom accrues great wealth. Therefore he must seek out the best value for his hard-earned dollar.

The range of amplifiers and accessories available is staggering, as are the prices. A piece of equipment must be chosen that will stand the player in good stead through all the trials and tribulations that musicians encounter. A good amp can cost up to $1600, which is a pretty hefty outlay, but there are many musicians who have regretted paying less for an inferior product.

It would seem a much wiser course to diligently save and buy quality equipment right from the start. If nothing else, the resale value will be higher when you finally realise that the bright

A new range of high power drivers recently released by Etone, of 53 Stanley St, Peakhurst, NSW. The 484 has a 7.5cm voice coil and is rated at 200W RMS, being intended especially for bass guitar. The 801, also 200W, has a response extended into mid-range to suit PA. The 805, at 250W, is for very high power use and would normally be installed in a W-bend (folded horn) enclosure.

Korg's SE-100 tape echo unit uses five playback heads to give a wide variety of effects. (Farrells Music, 505 Pittwater Rd, Brookvale, NSW 2100).

The graphic equaliser is an important piece of equipment for the performing musician. It allows the harmonic content of the sound to be adjusted to suit the acoustics of a specific venue, or it can be used to accent a particular tone range. Shown at left is the Peavey 400 which allows adjustment of two channels, providing a maximum of 15dB boost or cut in six bands. The first three bands adjust the fundamental, and the three higher bands adjust the harmonic content. (Australis Instruments Pty Ltd).

The Dynacord DT83 120W speaker system incorporates a 30cm full range speaker and two piezo horn tweeters. It uses a "dual-tune" principle to give an extremely high sound pressure, and is designed for life on the road with a rugged aluminium case and lockable cover. The Dynacord range includes a very wide selection of speakers, high-powered amplifiers, mixers, monitors, tape and digital reverb. units, equalisers, studio amps, interface units, etc.

lights of stardom are out of reach.

It is interesting to note that solid-state techniques have not quite displaced the valve in stage equipment, as has happened in home music equipment. Certainly, many guitarists are still sticking with valve amplifiers. They claim that there is a mysterious something about them, often referred to as "warmth"; further, that they are capable of giving both a soft, mellow sound — or an overpowering musical overload that solid-state circuitry cannot emulate! I am convinced that, for a long as musicians play through amplifiers, the faithful valve will not die.

This has been a very general outline of what musicians look for when buying equipment. The range available is bewildering. I have not even attempted to give descriptions of the myriad special effects pedals and other equipment available, much of it at a respectable cost.

Electronics is opening up new vistas to the music industry. Recording techniques are continually improving. New bands with new ideas are accepted. The techniques and expertise expended on home music products are being successfully integrated into the realm of live music, modern and classical.

Electrons are taking their place alongside pipes, strings and hammers!

IF YOU WANT TO UNDERSTAND MORE ABOUT MICROPROCESSORS

ABC

APPLY HERE...

One of the fastest growing sections of the electronics industry is microprocessing and its associated technology. A sound basic knowledge and a constant up-dating of that knowledge is necessary to stay informed of the developments within this exciting new technology.

Stott's Technical Correspondence College has produced an up-to-the-minute home study course specifically designed for people interested in this subject.

This Stott's home study course has been meticulously prepared by experts in this field and takes you through the stages necessary to reach a basic understanding of micro-computers and the processing techniques needed for their application, whether for consumer or industrial use. To this basic training you can add further knowledge and gain more experience.

The course is prepared in three stages. It begins with initial training in basic electronics, goes on to digital electronics and then proceeds to an in-depth study of microprocessors.

For further information on Stott's Microprocessors Course or other courses which interest you, mail the coupon below.

Stotts
TECHNICAL CORRESPONDENCE COLLEGE
The name to trust in correspondence education.

Melbourne, 159 Flinders Lane, 3000. Tel: 63 6212
Sydney, 383 George Street, 2000. Tel: 29 2445
Brisbane, 290 Adelaide Street, 4000. Tel: 31 1627
Adelaide, 85 Pirie Street, 5000. Tel: 223 3700
Perth, 140 St. Georges Terrace, 6000. Tel: 322 5481
Hobart, 1st Fl. 29 Argyle Street, 7000. Tel: 34 2399
Singapore, P.O. Box 3396, Singapore 1.

Please send me free and without obligation full details of the following courses:

(PLEASE PRINT) ____________________

____

MR MRS MISS ____________________ AGE ______

ADDRESS ____________________

____________________ POSTCODE

Stott's undertake that no sales counsellor will visit you

The Stott's range of courses in Electronics is:

Radio for Amateurs
Introduction to Electronics
Digital Electronics
AM Radio Receivers
Radio/TV Servicing
Colour Television
Amateur Radio Operators' Certificate
A full range of Hobby and Business courses also available.

ALA/ST1438/EA580

FORUM

Conducted by Neville Williams

THE GREAT TV SET "BOMB" SCARE

If reports from the popular media are to be taken at face value, that TV receiver in your lounge room is a potential time bomb, with the ability to explode, to destroy your home, to maim and to kill. If you're worried or apprehensive, forget it. Your emotions have been got at by well intentioned but ill-informed people. Treated with ordinary commonsense, your TV set is no more a hazard than a hundred other things around the home.

The ruckus all started when an 8-year-old boy suffered burns and a house was severely damaged by fire at Emerton, in Sydney's outer western suburbs.

According to published reports, the fire broke out at 6.00am, when the lad switched on the four-year-old colour receiver in the lounge room. According to his father: "The TV just went up. I woke to a sound like a 'roar'." The rest of the story was typical of a house fire, from whatever cause: the concern to get everyone out, the distress, the helpfulness of neighbours and so on.

Undoubtedly, for the family concerned, it was an unforgettable and traumatic experience, deserving of our sympathy and support.

However, the idea of an explosion and fire originating in the family TV receiver grabbed the attention of the popular media across Australia. After all, practically every family has at least one. If they're likely to explode spontaneously when switched on, then we are all at risk. It would be like having an incendiary bomb around the place.

When the story broke, various people were contacted who might know something about the problem, and their opinions were widely quoted. To say the least, certain of those "opinions" staggered those of us who have spent a lifetime in electronics. For example:

- Television sets should be turned off at the power point and the power lead withdrawn, to prevent power from flowing and "building up" in the set.
- If power builds up in the set, there may be a surge when it is switched on. This could be accompanied by a spark which might cause the set to explode.
- Colour television sets are more prone to explode than black and white sets.

Whatever else might have been said by way of qualification, these are the points which grabbed public attention. In my own immediate circle I heard of a pensioner who refused to go to bed until her ageing husband crawled down behind the TV set to do what they had been bidden; again, of the administrator of a home, who promptly imposed a similar rule on patients and staff.

I tried to backtrack on some of this advice and came across at least two very embarrassed people — embarrassed because what they had said had been completely misunderstood, or misinterpreted or something. In particular, they were keen to disown the concept of the power "building up"; where it had originated they could not even suggest, unless it was in the mind of a complete layman.

"The man on the tele said that colour sets could go off like a bomb!"

There is no justification whatever for this claim.

I also made a point of talking with other people who have a first-hand knowledge of TV receivers and found them just as concerned about the scare stories as I was. None of them could suggest any routine scenario leading to explosion and fire in a set. Pressed to speculate on what might have happened to the particular receiver at Emerton, they could only grope at way-out possibilities; there was no pattern to which they could point.

Significantly, having talked about the very vague possibilities of this or that happening, not one of them had built up any apprehension in the matter. None saw their TV set as a hazard, and not one accepted the desirability of using anything but the normal console on-off switch. As more than one remarked, they could see greater risks in groping for an out-of-the-way power point: from overturned furnishings, a strained back, or a power cord prematurely fractured by extra handling.

It was pointed out that the on-off switches fitted to TV sets are rated at 250V AC and are type-approved. What's more, they are almost invariably double-pole types, breaking both the active and the neutral mains wire — which is more than can be said for some wall switches. If they fail at all, they do so in an obvious manner. In the "off" position, the set won't work at all; in the "on" position, the set can't be switched off, except at the wall.

The attitude of the reticulation authorities is that, if a device has been formally type approved, then that approval would cover the use of an inbuilt on-off switch. Domestic TV sets are included in that observation.

I stress that, in saying this, the people I talked with were not executives concerned primarily with protecting the image of an industry. They were just ordinary acquaintances, genuinely puzzled by what had reportedly happened at Emerton, and concerned by the amount of apparent misinformation which the accident had generated.

Having said this, let me turn the clock back in order to understand where we are at, in the technical sense.

Personally, I am no stranger to electrical misadventure. In the early 1930s I commenced work in a radio factory where receivers coming off the line were being fitted with a new, locally-produced power transformer. Externally, it was well finished but, internally, it had unforseen problems with chemical interaction between the wire coating, and organic insulating materials and varnishes. At least, that is what I understand the problem to have been.

Suddenly, after about 12 months, those transformers began to fail — and in a most spectacular fashion. Turns would short, the winding temperature would soar and the varnish would emerge as a noxious brown cloud, half smoke and half vapour, to foul everything in the room. What the home owners used to say would not bear repeating!

The receivers themselves would be liberally coated with stinking, gooey varnish. Almost invariably, they would have to be completely stripped and rebuilt — easily the least popular job in the factory. In these days of high labour costs, they would simply have been consigned to the dump and replaced by a new set.

Why didn't the fuse prevent that from happening? What fuse? Those were the days before individual chassis fuses, while those in the switchboard outside were none of your critically designed cartridges. Any handy piece of wire that kept the current flowing was a fuse!

I'll say more about this later.

A significant thing was that, in a whole string of such mishaps, nothing ever went beyond the smoke and smell stage. The symptoms were so inescapable that the sequence was simple: stink — panic — switch off — reach for the phone!

Situations like that taught local receiver manufacturers an early and valuable lesson. Power transformer failures became quite rare and much closer attention was given to on-chassis fusing and mains cord detail.

A new series of lessons had to be learned in the '50s, when the Australia electronics industry launched into TV set production. With a much greater parts count, and in the context of higher voltages and currents, all companies had to struggle to achieve a reasonable degree of overall reliability. Even so, the failure rate was high enough to keep a small army of TV servicemen clothed and fed.

When colour television loomed on the horizon, manufacturers were very apprehensive indeed. With more critical circuitry and three times as many bits, the failure rate could have reached quite staggering proportions.

In odd cases it did!

But, quite fortuitously, the arrival of colour television in Australia coincided with the maturing of solid-state technology, with transistors, integrated circuits and steeply up-graded supportive components. Instead of going up, the failure rate turned sharply down, to the point where manufacturers and distributors are now offering up to 4-year warranties.

What's more, physical, as well as electrical properties have come under scrutiny. Several times it was pointed out to me that the "waxes" and "pitches" that might once have supported combustion have disappeared from TV receivers, to be replaced by materials that may smoulder or char under provocation, but not more than that. Particle board cabinets are still used, but the backs are typically flame retardent.

In short, far from modern colour receivers being more of a hazard than old black and white sets, the reverse is more likely to be the case. The failure rate from all causes is statistically lower, and the materials safer.

If you've lived with one or another TV set in your lounge room since 1956, there is certainly no reason now to become suddenly apprehensive!

Which brings me to the point where we all got hung up: how can a colour TV set explode spontaneously into naked flame?

We all know that an evacuated picture tune can "implode" if the glass fails for any reason. A prime emphasis in tube design has been to minimise the risk of it happening at all, or risk to life and limb if the worst should actually occur. But the implosion of a picture

MISINFORMATION OF ANOTHER KIND . . .

A South Australian reader sent us a clipping from an old (1976) copy of "The Advertiser" newspaper. In summary it offers this advice:
QUESTION: I would like to know just how to detect when a (phono) cartridge is worn out. Also, are there other components in a record player which, when worn out, could also damage records?
ANSWER: The only way to tell whether a cartridge is worn out is if the left or right speaker goes off completely. You can get it checked at any record shop. The stylus may damage records when worn, if it is not changed after about nine months, which is the average lifetime of a diamond stylus. It will cut into the record or else it will knock the alignment of the arm.
COMMENT: That answer must surely qualify for some kind of an award.

worth waiting for

When you assemble

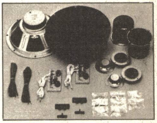
CORAL

SPEAKER KITS

it may take longer but
you save money and have
the satisfaction of completing
the job yourself.

KITS CURRENTLY AVAILABLE ARE

25cm (10") 3-WAY 3-SPEAKER SYSTEM KITS (One pair)
10SA·1



Illustrated 12SA1

30cm (12") 3-WAY 4-SPEAKER SYSTEM KITS (One pair)
12SA·1

• Speakers: two 30cm (12") woofers, two 12.5cm (5") cone squawkers, four 6.5cm (2-1/2") cone tweeter. • Impedance: 8Ω • Crossover frequency: 1,000Hz, 10,000Hz • Output sound pressure level: 95dB • Program source input: 60W • Frequency response: 30~20,000Hz (55ℓ Air-tight enclosure)

(NOTE: Enclosures not included. Build, or purchase to individual requirements)

20cm (8") 3-WAY 3-SPEAKER SYSTEM KITS (One pair)
8SA·1

16cm (6-1/2") 2-WAY 2-SPEAKER SYSTEM KITS (One pair)
6SA·1

AND WHEN YOU'VE GOT IT ALL TOGETHER WE HAVE STEREO CARTRIDGES TO COMPLEMENT YOUR HI-FI SYSTEM

CORAL
speaker system kits

Distributed throughout Australia by

AWA

Hi-Fi Audio Equipment

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED
554 Parramatta Road, Ashfield,
NSW 2131 Phone 797 5757

Canberra 80 5915
Melbourne 560 4533
Launceston 44 5155
Hobart 72 4366
Adelaide 272 2366
Perth 271 0888
Townsville 79 6155
Brisbane 44 1631

IN THE RACE FOR A BETTER RELAY

INTRODUCTION

These fully solid state relays use twin power SCR's and built in snubbers to permit use on highly inductive loads. The aim being to provide immunity from line voltage spikes.

FEATURES

With photo-isolation; zero voltage switching; TTL compatible control; up to 4000V RMS isolation (2500V as standard); up to 45A continuous current rating; reverse polarity protection; SSR's to switch DC available, the OPTO 22 SSR makes for the ideal choice for all switching applications.

We believe Opto 22 is the best in the business

HAWKER SIDDELEY

CROMPTON PARKINSON

(AUSTRALIA) PTY. LIMITED

Head Office and Works: Farrow Road, Campbelltown, N.S.W. Phone (046) 25 0251. Telex 20870
Branches: Sydney Melbourne Brisbane Adelaide Perth Hobart Newcastle Wollongong Orange Townsville

tube is a structural matter — noisy, unpleasant, but devoid of any flame phenomena.

It certainly couldn't set fire to anything.

In the electrical circuitry, breakdowns can occur, perhaps producing a spark, a "splat", an arc, or tracking and burning across insulation; there may possibly be some noise, some smell, even some smoke. But such damage will normally be localised within the "works" of the receiver. An explosion would seemingly need some gas to be present, or a volatile liquid. Naked flame would require a highly flammable substance which could transmit the flame to the cabinet or to the outside environment.

NO OBVIOUS SOURCE

But from where the gas, the liquid or the highly inflammable substance in an ordinary colour set could come I simply can't imagine!

This is where some of the way-out suggestions came in. One of them was published and, I suspect, somewhat garbled in the process: cats should not be allowed to sleep on TV sets, because their hair might penetrate the slots in the set and lead to overheating. More likely, their bodies would simply block ventilation, hair or no hair!

I haven't seen many cats sleeping on top of TV sets but decorative mats and the like are commonplace. If you must use doylies, keep them clear of ventilation slots. In a way-out worst-case situation, they may just cause overheating and breakdown, they may pick up a stray spark, and they communicate a flame to nearby curtains. But it's hard enough to imagine, let alone take seriously!

Again where there are doylies, there may also be water-filled flower vases, which raises the possibility of accidental spillage. Milady may carefully wipe the cabinet but what about the water that has dripped down inside? It may cause a breakdown but hardly an explosion.

Explosion?

Would there be a risk from some volatile liquid and, if so what liquid? A cleaning fluid? A polish? A household spray? A cosmetic spray?

These were the things that were considered in an unconvincing search for something to explain a spontaneous explosion at switch-on.

In saying all this, it might seem that I am/we are denying the very possibility of a fire in a TV set. But no . . .

Something did happen at Emerton to injure a boy and severely damage a home. It has yet to be explained.

More than that, Supt Harry Atkinson of the NSW Fire Prevention Dept told me that figures for 1977 indicated an average of just over one fire per week in NSW involving TV receivers. He stressed, however, that TV sets were the alleged, not necessary proven, cause of such fires.

After all, if a fire demolishes a TV set, along with other furnishings, it may be quite difficult to be sure where it really started.

Another acquaintance, who heads up a major TV service organisation confirms that they see their share of fire-damaged receivers.

Mostly, the damage is confined to the internal circuitry and almost invariably it has resulted from leaving a receiver switched on and unattended. The kids race in from school, switch the set on and then go outside and forget it. Or Mum does likewise and goes outside to attend to the washing.

If a breakdown occurs, there is no one in the house to notice that the set has failed, or to hear the sizzle or react to the funny smell.

Could it be, I asked, that some such sets are damaged unnecessarily because someone has carelessly fitted an over-rated fuse? Quite possibly.

What about a spontaneous explosion at switch-on? I can't imagine how it could happen.

What about sets that have a standby position, as well as a full on-off switch; would they be at greater risk? Theoretically yes, but most of the circuitry is switched off anyway. We do not regard them as a hazard, and they've all been type approved anyway.

ANY OTHER IDEAS?

And there I must hand the problem to you, the reader. Is there something that I/we have missed? I can assure you that the Fire Prevention Authorities would be most grateful if "Forum" can elicit information on explosions or alleged explosions, fires or alleged fires in family TV sets.

One other point I think I should make: right now, we are seeing a proliferation of audio, video and other equipment fitted with clocks, timers and memory facilities. The intention is that it be plugged into the mains and left switched on for days and weeks and months on end. Given proper design and fusing, we can see no objection to this and it has certainly been ratified by authorities world-wide.

If there is any justification or urgency for the "switch off at the wall approach" then it had better be demonstrated fast.

If not, let's bury it firmly and deeply and save a lot of people from the needless chore of groping for inaccessable power points.

fact: there's a Shure microphone that's right for your application & equipment...

SM81
First of the new breed of high-performance, studio-quality unidirectional condensers—technically state-of-the-art, exceptionally rugged and superb sound.

SM59
You've seen it on TV musical shows where sound quality is a must. Unidirectional, dynamic with *exceptionally* flat response, extremely low handling noise; mellow, smooth, and accurate sound.

SM58
The most widely used "on-stage" hand-held dynamic cardioid microphone—the world standard noted for its distinctive, crisp sound.

UNIDYNE® III
The world-famous *UNIDYNE®* III family offers top value per dollar. Uniform cardioid pattern helps control off-axis coloration, background noise, and feedback.

SM61
Omnidirectional dynamic. Outstanding low handling noise. Handsome, smooth looks with new VERAFLEX® dent-resistant grille—a favorite on-camera mic with soundmen and entertainers.

AUDIO ENGINEERS P/L
342 Kent Street,
SYDNEY 2000 N.S.W.

AE 149/TP

Hi Fi Topics

TECHNICS UNVEILS ITS NEW HIFI EQUIPMENT RANGE FOR THE '80s

Mr Toshiro Masui, Director, Stereo Division, Matsushita Elec. Industrial Co. Ltd, Osaka, Japan.

At a seminar held at Terrigal, NSW, National Panasonic (Aust) Pty Ltd unveiled to technical journalists and selected dealers an impressive array of Technics hifi equipment for the '80s. But, over and above mere equipment, the occasion served to highlight important marketing trends, which were discussed at some length.

by NEVILLE WILLIAMS

At the local level, the seminar was hosted by National Panasonic's Managing Director John Ukita and by Marketing Manager Peter Lee, supported by Warwick Gould and interstate managers.

Representing the parent company was director Toshiro Masui (pictured) and four other men whom technical journalists had met in Japan two years ago: Jim Matsonaka, Ichiro Matsumoto, Hirofumi Osaki and Steve Shikamatsu. Collectively, they reflected management, engineering, production and marketing interests.

The range of equipment selected for release in Australia for the 80s takes cognisance of emerging local trends in respect to individual components, to receivers and to systems, both full-sized and compact. The Technics approach has been to optimise performance and appeal in all these areas, while maintaining prices at as competitive level as possible.

For those looking for individual components, the new Technics range begins with two budget-priced integrated amplifiers SU-Z1 and SU-Z2, capable of delivering a nominal 25W and 35W respectively per channel at low distortion. Tentative recommended retail prices are $189 and $239.

Extending the range, however, is a whole new series of amplifiers featuring special circuitry in the output stage which, according to Technics engineers, offers the advantage of Class-A (eg no switching distortion) with the economy of class-B operation.

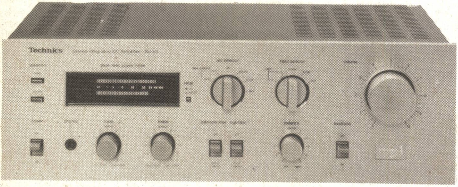
Designated as the "SU-V" series, they provide power levels from a nominal 40W per channel (RRP $299) to just over 100W (RRP $679) with rated distortion figures from 0.02% for the 40+40W unit to 0.007% at the top of the range.

To the surprise of those present, it transpired that the system adopted for the new "class-A" amplifiers was not the same as in their much vaunted earlier 350+350W unit (see our February 1978 issue). On that occasion we quoted Technics engineers as saying that the circuitry could be scaled down quite readily to more typical domestic requirements. In fact, this has proved not to be the case and the new amplifiers rely on what is described as a "synchro-bias" system. (We hope to have more to say about this in a forthcoming issue).

In the meantime, the specifications look most impressive.

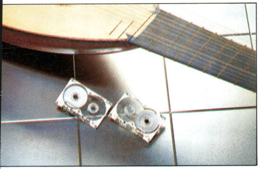
To mate with the integrated amplifiers, Technics are offering a range of AM/FM stereo tuners. Some are styled and priced to match the "budget" end of the amplifier range, while others have the "slimline" look, plus quartz lock, plus timer etc. But, irrespective of style and price, they also look good and the figures are good.

Tape decks also featured large at the Terrigal seminar and prospective buyers will have the choice of a half-dozen or so models, ranging from style-matched economy models to others with direct drive motor, soft-touch traverse controls, remote control, auto-



In an effort to broaden the appeal of their new class-A amplifier range, Technics are planning to market this SU-V2 stereo integrated DC amplifier at $299. It will deliver 2 x 40W into 8 ohms, 20Hz to 20kHz at 0.02% distortion; power into 4 ohms at 1kHz at 0.02% is quoted as 2 x 55W. Other ratings are very attractive. The SU-V2 also has more than the usual share of control facilities, including a sensitivity switch for the FL metering.

The warmth of metal.



New metal tape promises purer music. But it depends on the tape deck if that promise becomes real.

Pure iron particles explain the superior performance of metal tape. Greatly improved dynamic range, far higher S/N, wider frequency response, and radically reduced distortion mean purer music.

Sansui's new SC-3330 brings that purer music to life. All the subtle nuances of recorded sound, from the metallic overtones of a piccolo to the warm resonance of an old lute are breathtakingly reproduced.

Particularly critical for smooth Debussy or Fleetwood Mac on metal is Sansui's exclusive FH head (FeAlSi alloy head). Advantages include extra-long life, ultra-high MFD (maximum flux density) to prevent high bias saturation, and a special hyperbolic head. Sansui developed that head shape to minimize the contour effect for a wide-range *Pelléas* or *Tusk*.

Keep in mind, too, that our special head formulation isn't superficial — it's throughout the head, from surface to core. And 200% more erase current means our erase head does a clean job indeed.

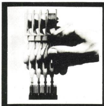
Front-loading, two DC motors and feather-touch controls with full logic for a host of automatic functions are other refinements. The 16 LED Bar-Graph Meter makes recording exceptionally accurate. Wow & flutter: 0.04%. Frequency response: 20 — 18kHz (metal). Erasure factor: 70dB. Special features: too many to list. Performance: brilliant.

Sansui's SC-3330: the new deck everyone feels passionate about!

SANSUI

SC-3330

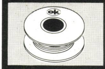
SANSUI ELECTRIC CO., LTD.
14-1 Izumi 2-chome, Suginami-ku, Tokyo 168, Japan
VANFI (AUST.) PTY. LTD.
297, City Road, South Melbourne, Victoria 3205,
Australia Tel: 699-5473
283 Alfred Street, North Sydney, N.S.W. 2060,
Australia Tel: 929-0293



JUST WRAP™ WIRE WRAPPING TOOL

WHY CUT? WHY STRIP? WHY SLIT? WHY NOT JUST WRAP?

JW-1-B	BLUE WIRE
JW-1-W	WHITE WIRE
JW-1-Y	YELLOW WIRE
JW-1-R	RED WIRE



JUST WRAP REPLACEMENT ROLLS

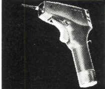
R-JW-B	BLUE WIRE	50 ft. Roll
R-JW-W	WHITE WIRE	50 ft. Roll
R-JW-Y	YELLOW WIRE	50 ft. Roll
R-JW-R	RED WIRE	50 ft. Roll

UNWRAP TOOL FOR JUST WRAP

JUW-1	UNWRAPPING TOOL

JUST WRAP KIT

JWK-6	JUST WRAP KIT



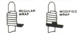
"HOBBY" WIRE WRAPPING TOOL BATTERY POWERED

BW-2630	FOR AWG 26-30

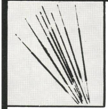
Use "C" size NICAD Batteries, not included. Bits not included.

BT-30	BIT FOR AWG 30
BT-2628	BIT FOR AWG 26-28

HOBBY WRAP TOOLS



WSU-30	REGULAR WRAP
WSU-30M	MODIFIED WRAP

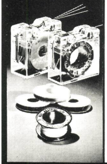


PRE-STRIPPED WIRE WRAPPING WIRE

Wire for wire-wrapping, AWG-30 (0.25mm) KYNAR® wire, 50 wires per package stripped 1" both ends.

® KYNAR PENNWALT

30-B-50-010	30-AWG blue Wire, 1" Long
30-Y-50-010	30-AWG Yellow Wire, 1" Long
30-W-50-010	30-AWG White Wire, 1" Long
30-R-50-010	30-AWG Red Wire, 1" Long
30-B-50-020	30-AWG Blue Wire, 2" Long
30-Y-50-020	30-AWG Yellow Wire, 2" Long
30-W-50-020	30-AWG White Wire, 2" Long
30-R-50-020	30-AWG Red Wire, 2" Long
30-B-50-030	30-AWG Blue Wire, 3" Long
30-Y-50-030	30-AWG Yellow Wire, 3" Long
30-W-50-030	30-AWG White Wire, 3" Long
30-R-50-030	30-AWG Red Wire, 3" Long
30-B-50-040	30-AWG Blue Wire, 4" Long
30-Y-50-040	30-AWG Yellow Wire, 4" Long
30-W-50-040	30-AWG White Wire, 4" Long
30-R-50-040	30-AWG Red Wire, 4" Long
30-B-50-050	30-AWG Blue Wire, 5" Long
30-Y-50-050	30-AWG Yellow Wire, 5" Long
30-W-50-050	30-AWG White Wire, 5" Long
30-R-50-050	30-AWG Red Wire, 5" Long
30-B-50-060	30-AWG Blue Wire, 6" Long
30-Y-50-060	30-AWG Yellow Wire, 6" Long
30-W-50-060	30-AWG White Wire, 6" Long
30-R-50-060	30-AWG Red Wire, 6" Long



TRI-COLOR DISPENSER

WD-30-TRI	TRI-COLOR DISPENSER
R-30-TRI	REPLACEMENT ROLLS

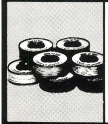
WIRE DISPENSER

WD-30-B	BLUE WIRE
WD-30-Y	YELLOW WIRE
WD-30-W	WHITE WIRE
WD-30-R	RED WIRE

DISPENSER REPLACEMENT ROLLS

R-30B-0050	30-AWG BLUE 50 FT. ROLL
R-30Y-0050	30-AWG YELLOW 50 FT. ROLL
R-30W-0050	30-AWG WHITE 50 FT. ROLL
R-30R-0050	30-AWG RED 50 FT. ROLL

®KYNAR-PENNWALT



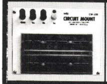
HOOK-UP WIRE

HK-18	18 AWG	25 FT.	SOLID CONDUCTOR
HK-20	20 AWG	25 FT.	SOLID CONDUCTOR
HK-22	22 AWG	50 FT.	SOLID CONDUCTOR
HK-24	24 AWG	50 FT.	SOLID CONDUCTOR
HK-26	26 AWG	50 FT.	SOLID CONDUCTOR
SHK-18	18 AWG	25 FT.	STRANDED CONDUCTOR
SHK-20	20 AWG	25 FT	STRANDED CONDUCTOR
SHK-22	22 AWG	50 FT.	STRANDED CONDUCTOR
SHK-24	24 AWG	50 FT.	STRANDED CONDUCTOR
SHK-26	26 AWG	50 FT.	STRANDED CONDUCTOR

PRB-1 DIGITAL LOGIC PROBE

- DC to > 50 MHZ
- 10 Nsec. pulse response
- 120 K Ω impedance
- Automatic pulse stretching to 50 Msec.
- Automatic resetting memory
- Open circuit detection
- Automatic threshold resetting
- Compatible with all logic families 4-15 VDC
- Range extended to 15-25 VDC with optional PA-1 adapter
- Supply O.V.P. to ≮ 70 VDC
- No switches/no calibration

PRB-1	DIGITAL LOGIC PROBE



PROTOTYPE BOARD CM-100

TERMINALS: 1,020 TEST POINTS. 188 separate 5 point terminals, plus 2 horizontal bus lines of 40 common test points each.

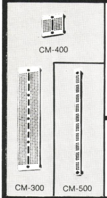
SIZE: 6½" Wide, 5" Long.

CM-100	MODULAR PROTOTYPE BOARD

PROTOTYPE BOARD CM-200

TERMINALS: 630 TEST POINTS. 94 separate 5 point terminals, plus 4 bus lines of 40 common test points each. SIZE: 6" Wide, 3½" Long.

CM-200	MODULAR PROTOTYPE BOARD



PROTOTYPE BOARD CM-300, CM-400

CM-300 and CM-400 have two separated rows of five interconnected contacts each. Each pin of a DIP inserted in the strip will have four additional tie-points per pin to insert connecting wires. They accept leads and components up to .032 in. diameter. Interconnections are readily made with RW-50 Jumper Wire. All contact sockets are on a .100 in. square grid (1⁵⁄₁₆ in. wide).

CM-300	MODULAR PROTOTYPE BOARD
CM-400	MODULAR PROTOTYPE BOARD

MODULAR BUS STRIP

CM-500 is a bus strip to be used in conjunction with CM-300 and CM-400 for distribution of power and common signed lines. Two separate rows of common terminals, grouped into clusters of five. All contact sockets are on a .100 in. square grid.

CM-500	MODULAR BUS STRIP

DIP IC INSERTION TOOLS WITH PIN STRAIGHTNER

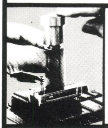
Narrow profile. Pin straightener built into tool. Automatic ejector.

INS-1416	14-16 PIN DIP/IC INSERTER

MOS, CMOS-SAFE

GROUND STRAP NOT INCLUDED

MOS-1416	14-16 PIN, MOS CMOS SAFE INSERTER
MOS-2428	24-28 PIN, MOS CMOS SAFE INSERTER



36-40 PIN CMOS-SAFE IC INSERTION TOOL

Aligns bent out pins. Includes terminal lug for attachment of ground strap.

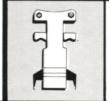
GROUND STRAP NOT INCLUDED

MOS-40	36-40 PIN CMOS SAFE INSERTION TOOL

DIP IC EXTRACTOR TOOL

Extracts all LSI, MSI and SSI devices of from 8 to 24 pins.

EX-1	EXTRACTOR TOOL



24-40 CMOS-SAFE EXTRACTOR TOOL

Removes 24-40 pin IC's, .600" centers. C-MOS safe. Includes terminal lug for attachment of ground strap.

GROUND STRAP NOT INCLUDED

EX-2	CMOS SAFE EXTRACTOR TOOL

AMPEC ENGINEERING CO. PTY. LTD. 1 Wellington Street, Rozelle, 2039. Tel: (02) 818-1166. **Available from: NSW** David Reid Electronics, 29-6601. Radio Despatch Service, 211-0191. Electronics (Distributors), 636-6052. Martin De Launay, 29-5834. Applied Technology, 487-2711. **Vic.** Radio Parts, 329-7888. Stewart Electronics, 534-3733. Arlin Instruments, 569-6984. Ellistronics, 602-3282. **S. Aust.** Protronics, 212-3111. **W. Aust.** Reserve Electronics, 328-3116. **Qld.** Wilber Sales, 391-5136.

tape select, auto record level, two-colour bar graphs and so on.

But even the basic RS-M8 has in-built Dolby noise reduction, bar-graph metering, metal tape compatibility and a wow and flutter figure of .07% RMS.

Indeed, all the new decks are metal compatible and for a good reason: according to the Japanese engineers present, production of metal coated tape is being stepped up at present and, by June, the supply of metal tape cassettes in several brands (including Technics) should be much freer. Hopefully, this should prompt a reduction in price.

Questioned about double-speed and half-speed facilities, they said that the few companies that had released such models had done so on their own initiative. Technics were in a position where they could move readily to a multi-speed design but they preferred to conform to the voluntary constraints of the Philips compact cassette system and be part of an industry-wide move — if there was to be such.

A point that did emerge from this discussion, however, was further confirmation of our tip on the microcassette system (February 1980 issue, page 33). A Technics engineer briefly demonstrated a musical segment on Angrom cobalt-coated tape, played on a pocket-sized recorder, through a full hifi system. It certainly showed all the makings of a new super-compact music system, just awaiting further development. The microcassette, rather than multi-speed, may be the next major option, with particular reference to its use in cars and portable players.

Conventional phono turntables were largely taken for granted at the seminar, if only because Technics are solidly established in this field already, particularly with direct-drive models, which they largely "fathered".

However, their highly compact SL-10 phono turntable was very much in evidence and was used for most of the demonstrations. With a surface area no larger than a record cover (see our December 1979 issue) it uses a moving coil cartridge attached to a tiny, linear tracking arm. Because the system is dynamically balanced, it can be used in any position and Technics engineers were quite happy to let it play along standing one edge, upside down, or propped awkwardly on one corner.

It even works the right way up!

The SL-10 is provided with an in-built pre-preamplifier so that it can operate into any system intended for a normal magnetic cartridge. In fact, all the upper-end integrated amplifiers in the new Technics range have their own pre-preamplifier incorporated, allowing them to work directly from virtually any low impedance moving coil cartridge.

Unfortunately, the SL-10 does not come cheaply and, at a recommended retail price of around $669, one would have to set quite a premium on its small

Supply sources for the Playmaster 3-13L system

Although originally described in our December 1979 issue, supplies of drivers and cabinets for the Playmaster 3-13L loudspeaker system have been restricted for a variety of reasons. Etone Pty Ltd, who distribute the drivers in Australia, have furnished us with a list of potential suppliers.

The 3-13L system is notable for its small size: 270mm (w) x 385mm (h) x 200m (d), with a nominal internal volume of about 13 litres. A pair of them can stand unobtrusively on shelves, on or a cupboard top.

The 3-13L uses three moving cones: an Etone NT2FS tweeter to handle frequencies above a nominal 1500Hz, and an Etone 16cm type 608 for the lower frequencies. The third unit is an Etone type 600 passive radiator.

We presented the system under the heading "A Big Sound From Two Small Enclosures" and that summed up our reaction when we had them set up and performing to advantage.

We were careful to point out, however, that small wide-range loudspeaker systems can only gain extended bass response by trading sensitivity. In apparent contradiction to its modest dimensions, the 3-13L is therefore not intended for use with low-power amplifiers. For ordinary listening in a flat or home unit, a 20+20W amplifier will suffice but, for more generous sound, the 3-13L systems should be used with a 40+40W or even a 60+60W amplifier.

Etone source the drivers and crossover network but they prefer to sell through component dealers. They do not handle cabinets. Etone are at 53 Stanley St, Peakhurst, NSW 2210. Phone (02) 534 3569

They list the following companies as being able to supply Playmaster 3-13L systems in one form or another:

SYDNEY:

Audiocraft Industries, 7 Queen St, Petersham 2049. Ph: 797 6144.

C.Q. Electronics, 95 Regent St, Sydney 2008. Ph: 698 8079.

H.S.C. Timber Pty Ltd, 25 Pritchard Place, Peakhurst 2210. Ph: 533 3141.

Omega Sound Sales & Service, 5/45 Stanley St, Peakhurst 2210. Ph: 53 6332.

Pre-Pack Electronics, 718 Parramatta Rd, Croydon 2132. Ph: 797 6144.

Sheridan Electronics, 164 Redfern St, Redfern 2016. Ph: 699 5922.

Radio Despatch Service, 896 George St, Sydney 2000. Ph: 211 0816, 211 0191.

MELBOURNE:

Contemporary Sound Centre, 87 Riversdale Rd, Hawthorne 3122. Ph: 818 5585.

Peterson Speaker Laboratories Pty Ltd, 4 Walter St, Moorabbin 3189. Ph: 553 1055.

Zephyr Products, 70 Batesford Rd, Chadstone 3148. Ph: 568 2922.

Details of the Playmaster 3-13L system were published in the December 1979 issue. Back numbers are still available from our editorial office for $1.40 plus 60c postage.

We've got news for you!

How many times have you seen build-it-yourself electronic and hi-fi kits and thought: 'No way could I build anything like that!'

NOW YOU CAN!

All of our Playmaster hi fi kits come with a highly detailed, step-by-step instruction manual – with far more constructional details than you'll find in the magazines. If you can hold a soldering iron and read simple English you can build one of these kits (yes, we even show you how to solder!)

And just in case you run into difficulties, there's our exclusive 'Sorry Dick, it doesn't work' repair coupon with allows you to have your kit repaired in our service centre for a token fee.

Plus our 7 day satisfaction guarantee: examine the kit, read the instructions – then if you feel the kit is beyond you, return it within 7 days for a full refund!

What have you got to lose?

And you'll save hundreds of dollars by doing it yourself.

Compare commercial equivalents: they're hundreds of dollars dearer. And each Playmaster audio component is perfectly matched – electrically and aesthetically – to the others in the series.

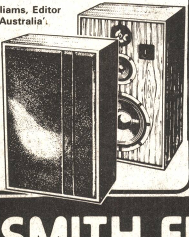
As we've said before: 'They look so good and work so well your friends won't believe you built them!'

Superb **Playmaster** Speakers

Just a couple of hours of your labour – and you'll have a set of speakers to be proud of. The hard parts are done for you: all woodwork is ready to fold together and glue. Rebates for the speakers are cut. The wiring is supplied in a no-soldering colour coded loom: just push the lugs onto their terminals!

Your choice of three superb systems to cater for any size system; any size room. Each box is finished in an attractive imitation walnut veneer, they look so good you don't even have to fit the beautiful sculptured acoustic foam grilles supplied.

Designed by Neville Williams, Editor in Chief of 'Electronics Australia'.



3-75L 12" 3-WAY SYSTEM
75 litre cabinet, with 12" bass driver. Has tone controls, too!
$284.00 pr

3-53L 10" 3-WAY SYSTEM
53 litre 'mid sized' cabinet, 10" bass driver. 3 speakers
$224.00pr

3-26L 8" 3-WAY SYSTEM
Smaller 26 litre enclosure suits flats, etc. Ideal for budget systems, too.
$149.50 pr

Playmaster hi fi components

The perfect partners for your Playmaster speakers: a Playmaster amplifier, or a Playmaster tuner. Or tailor your sound to suit your environment with a Playmaster graphic analyser and equaliser. All with the quality of design you'd expect from Australia's largest selling electronics magazine.

Each of the Playmasters was designed by Leo Simpson, Technical Editor of Electronics Australia. And with the exclusive features added by Dick Smith Electronics – like bronze anodised front panels, matching imported knobs, plated chassis, etc etc, your Playmaster will be a winner!

Playmaster Forty Forty Stereo Amplifier:
Very simple to build, performance equal to amplifiers two and three times the price!
Cat K-3411 **$129.50**

Twin Twenty Five:
Don't need so much power: try the twin 25. 25W rms per channel; ideal for compact speaker systems.
Cat K-3410 **$105.00**

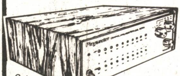
Digital Tuner/Clock
Superb AM and FM tuner with digital readout; plus clock. The tuner module is pre-built!
Cat K-3494 **$129.50**

Graphic Equaliser
Have your sound the way YOU want it. Easy to build kit gives you 'tailor made' response!
Cat K-3500 **$99.50**

NOTE: All units shown with optional walnut vinyl veneer sleeve: Cat H-3113 $8.50

NOW: A PLAYMASTER GRAPHIC ANALYSER

Two projects in one. Analyser lets you set up the system to best possible standard (use with graphic equaliser); also doubles as power output meter. Leds flash in sympathy with music according to level (up to 400 watts!) Get the most from your system: and impress your friends!



Cat
K-3510 **$99.50**

GO ON – HAVE A GO: YOU CAN DO IT!

DICK SMITH ELECTRONICS

SEE OUR OTHER ADVERTS IN THIS MAGAZINE FOR OUR STORE ADDRESSES AND RESELLERS

HIFI TOPICS — Continued

size.

As distinct from separate amplifiers and tuners, Technics were also showing a line of receivers combining AM/FM stereo radio reception with all the usual facilities of integrated amplifiers — but with the notable exception of an inbuilt MC pre-preamplifier.

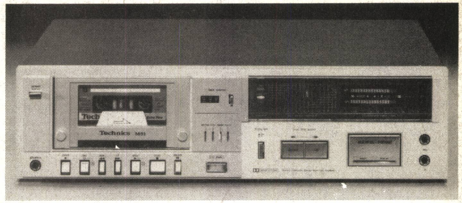
In discussing receivers, the point was made that the proportionate demand for them varies from city to city in Australia, probably due to local marketing initiatives and also to the activities and attitudes of the local press.

The new receiver range begins with the SA-101, priced at $239. It is rated to deliver 20W per channel at 1kHz into 4 or 8 ohms, at 0.04% distortion. It has all the usual facilities and an array of modern circuit techniques. The series runs through -202, -303, -404 to the SA-505, picking up additional facilities on the way, including fluourescent metering and indicators. Power also increments to 63+63W in the case of the SA-505. Prices had not been fixed, at the time, for the upper end of the range.

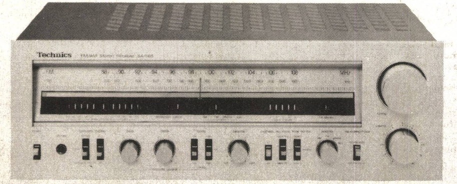
From receivers, attention at the seminar turned to systems — specific combinations of components and loudspeakers, with furniture rack available — ranging from budget-priced to deluxe.

It seems that systems are gradually taking over a significant proportion of the buyer dollar that was previously spent on three-in-one combinations. But it was equally apparent, from the discussion, that systems are something of a "hot potato" for specialist hifi dealers.

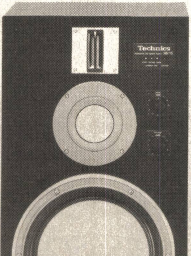
Traditionally, such dealers have been in a position to "mix and match" components to suit both their own inclinations and those of their customers. If this has lent a certain uniqueness to the hifi boutique, it has also produced its share of confusion in the marketplace.



ABOVE: One of several new cassette decks, this M51 model sets its own bias and compensation by sensing cutouts in the cassette body. It also senses the nature of the incoming signal and sets its own record level to suit. All the user needs to worry about is to operate the "soft-touch" tape traverse buttons. The user can, however, monitor the operation of the auto-record system and make manual adjustments, if desired.



The Technics SA-505 receiver offers 63W per channel with the same low distortion as an integrated amplifier. It also offers comparable facilities, including connections for two tape recorders and two sets of speakers. LED indicators read out signal strength and instantaneous power and also show the status of various functions and controls.



Big-boy of the new honeycomb disc speaker range is the SB-10 featuring a 32cm woofer, an 8cm mid-range driver and Technics special "leaf" tweeter. With phase linear configuration, the system has a rating of 150W music.

Inevitably, a proportion of customers have reacted by taking a second look at well known brand-name systems — and they have often liked what they see!

And this, in fact, was the reaction engendered by the new "Sigma" range systems by Technics. One could easily understand why a hifi buyer would opt for the easy way out: "I'll take one of those . . ." matching his/her choice to the capacity of their cheque book.

Hifi dealers can hardly stay aloof from systems, but they also have to face the fact that prospective customers may decide to buy from the department store down the street, either because of a price deal, or an existing credit arrangement.

As for Technics themselves, they have had no option but to respond to the market as it is and to provide truly competitive packages for those of their dealers who want to be in the business. All told, there are 10 systems in the new Sigma range.

At the "budget" end is the Sigma 101 comprising an SA-101 stereo receiver (already mentioned), an SL-B2 semi-automatic servo belt-drive turntable, an RS-M6MK2 cassette deck with Dolby NR, a pair of SB-K10 two-way loudspeakers, and an SH-518 audio rack with castors.

Add a graphic equaliser and the system becomes Sigma 101S.

So the components gradually escalate through receivers and amplifier/tuner combinations to the Sigma-80. This incorporates 40+40W power amplifier, quartz-synthesiser tuner/preamp, fully automatic direct-drive turntable, cassette deck with

Separating the mother from the master

Stanton-The Professional in the Recording Industry

Application – The Metal Mother – Stanton Plays it Back

Once the recording studio has delivered the lacquer disc to the plating plant it is sprayed with liquid silver making it electroconductive, and then electroplated with nickel which is separated from the lacquer. The nickel is now a negative image called a master and has, instead of a groove, a ridge that comes to a point. The master is treated and nickel plated again and upon separation forms a mother, a positive metal record. Engineers rely on the Stanton 881S cartridge in playback evaluation of the mother.

Stanton's 881S Professional Calibration Standard Cartridge is a sophisticated, low mass, phono pickup that features the patented Stereohedron® stylus tip for truest fidelity and gentlest possible treatment of the record groove.

© 1979 STANTON MAGNETICS

Sole Australian Distributors:
LEROYA INDUSTRIES PTY LTD
Head Office: 156 Railway Pde,
Leederville, Western Australia, 6007
Phone 81 2930
NSW Office: 7 Jordan Rd., Wahroonga,
2076. Phone 487-2543

STANTON
THE CHOICE OF THE PROFESSIONALS™

HIFI TOPICS — continued

fluorescent meters, audio rack with glass doors, twin three-way linear-phase loudspeaker systems, and an infra-red remote control system giving chairside control of most functions. For the entire system, Technics are currently aiming at a recommended retail price of around $2000.

Last but not least, there is the Sigma "Concise" 3 system — their word for compact. It comprises a 40+40W integrated DC amplifier, AM/FM stereo tuner, a front loading compact cassette deck with two-colour LED meters, a semi-automatic quartz-locked direct drive turntable and a pair of small linear phase loudspeakers.

Why not the SL-10 compact turntable?

Because, say Technics planners, the SL-10 would be over-priced at present for a compact system.

And who would buy a compact system in preference to a full-size system, which would look more imposing for the same money?

In one word . . . women! Many of them dislike racks full of hifi "machinery". If you want to sell a compact system, you display it where it will be seen by women shoppers!

So much for the overview of the Technics seminar, but two things warrant a closer look in forthcoming issues — their new honeycomb disc loudspeaker systems and the new "class-A" series of amplifiers. In particularly, we'll examine how the new class-A amplifiers work and whether the title is really justified.

IN BRIEF

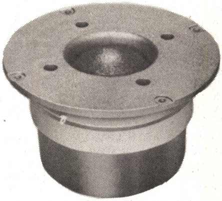
G.R.D. GROUP PTY LTD, distributors in Australia for Peerless loudspeakers, are proud of the new KA 20 DMR 2-inch mid-range driver. Its efficiency is quite good (90dB at 1m for 1W) but it has a 100W rating when used with a suitable crossover network. The response with crossover is as shown below, being notably smooth. Distortion is also said to be very low. Being set within the faceplate, the dome is physically protected, as well as benefiting by an "acoustic lens" effect. G.R.D. Group Pty Ltd are at 698 Burke Rd, Camberwell, 3124. Ph: (03) 82 1256.

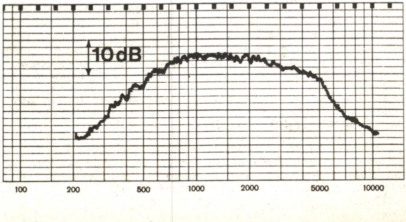
ETONE PTY LTD announce the expansion of their range of professional sound reinforcement products. Etone is now the importer and national distributor of EMILAR high frequency compression drivers and horns. EMILAR products are engineered specifically to meet the demands of modern sound reinforcement systems, involving extended high frequency response, low distortion and durability.

Etone is also now the NSW distributor for the various products imported by Zephyr Products of Melbourne. Included in the range are R.C.F. professional high frequency drivers and horns, and the Perreaux range of amplifiers. Of particular interest to the professional sound man is the Perreaux MOSFET model PM-2000 stereo amplifier, which offers 300W per channel into 4 ohms or 200W per channel into 8 ohms. It has a built-in cooling fan and retails for $716.

Further technical information on these products is available from Etone Pty Ltd, 53 Staxpey St, Peakhurst, NSW, 2210. Phone (02) 534 3569.

R.H. CUNNINGHAM PTY LTD have announced the appointment of Graham J. Haynes as National Sales Manager. Formerly, Manager of Southern States, Graham's responsibility now includes the whole of Australia, including the servicing of its distributors. The Company also advises that Ian L. Ramsay was appointed Technical Sales Represen-





From Toshiba: Two new cassette decks

Every month from Toshiba a new model — highlighted by a new model! The PC-X20 and PC-X40 (pictured) cassette decks feature low-profile styling, metal tape compatibility, Sendust R/P head and a 4-gap ferrite head for erase. Wow and flutter is 0.05% RMS or 0.16% DIN, with a response to 18kHz with metal tape. The PC-X40 also features "MQS" (Music Quick Sensor) which allows pre-programming of up to 6 tracks at a time.

tative for New South Wales. Ian brings with him, many years of technical expertise, including experience in the professional sound recording industry. He will be responsible for the sales of Cunningham professional audio products including, Sennheiser equipment, Neutrik connectors and transformers and Dowkey/Kilovac relays.

CONCEPT AUDIO PTY LTD have been appointed distributors for the KLH loudspeaker line, manufactured in the USA. During a recent visit, KLH Marketing Director Denis Wratten said that his company had completely repositioned itself in the loudspeaker market. They are majoring on what he described as a "computer controlled" range, the KLH-1, KLH-2 and KLH-3, which are estimated to retail at $1995, $1198 and $698 respectively. A fourth model KLH-4 is similar to the KLH-3 but "without the analog computer". For details: Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale, NSW 2100. Phone (02) 938 3700.

CONCEPT AUDIO PTY LTD, who have been distributing Rega turntables in Australia for 2½ years, now have the new Rega R100 cartridge, priced at $85. Designed by Roy Grundy to mate with his turntable, the cartridge is manufactured to specification in Japan. It will work well in all typical medium-mass arms and has a uncoloured sound quality. If purchased at the same time as a Rega turntable and arm, the cartridge is available at a reduced price. Details from Rega dealers or Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale, NSW 2100. Phone (02) 938 3700.

DYNAUDIO (AUST) PTY LTD was incorporated in Melbourne on Feb. 4, last. Technical Director is Mr Barry Arnstein, while marketing is in the hands of Mr Philippe Luder. Dynaudio is a Danish product and, initially, the Australian Company will be importing and marketing driver components only. Later, they plan to manufacture built-up systems in Australia. According to Philippe Luder, Dynaudio drivers will challenge the upper end of the market, with high power handling capability and very low distortion. They feature "Hexacoil" voice coil construction and the use of ferromagnetic fluid in the air gap. Dynaudio (Aust) Pty Ltd is at 654 Glenferrie Rd, Hawthorn, 3122. Ph. (03) 818 2872. Initial distribution will be through Tivoli Hi-Fi Pty Ltd (at the above address), through Sound Craftsman (Vic) and Leisure Sound Pty Ltd in NSW.

The Sennheiser "Profipower" dynamic mic.

R.H. CUNNINGHAM PTY LTD had hoped that their "Sennheiser "Profipower" musician's dynamic microphone could have appeared in our stage amplifier article elsewhere in the issue — but the timing didn't work out. With a supercardioid pattern, it has a wide response but is also very ruggedly built to withstand the rigours of a rock concert. A built-in "pop" filter and a low frequency cut-off filter minimise breath and handling noise. From R. H. Cunningham Pty Ltd, 146 Roden St, West Melbourne, Vic. 3003. Ph: (03 329 9633.

CHEAP TAPES!

BULK TAPES DISCOUNTED

maxell®

LN C60 ULTRA LOW NOISE Box of 12	$18.00
LN C90 ULTRA LOW NOISE Box of 12	$25.00
LN C120 ULTRA LOW NOISE Box of 12	$37.00
UD C60 ULTRA DYNAMIC Box of 12	$29.00
UD C90 ULTRA DYNAMIC Box of 12	$35.00
UDXL1 C60 EPITAXIAL Box of 12	$38.00
UDXL1 C90 EPITAXIAL Box of 12	$48.00
UDXL II C60 EPITAXIAL Box of 12	$40.00
UDXL II C90 EPITAXIAL Box of 12	$50.00

TDK®

D-C60 DYNAMIC Box of 10	$18.00
D-C90 DYNAMIC Box of 10	$23.00
AD-C60 ACOUSTIC DYNAMIC Box of 10	$28.00
AD-C90 ACOUSTIC DYNAMIC Box of 10	$33.00
SA-C60 SUPER AVILYN Box of 10	$34.00
SA-C90 SUPER AVILYN Box of 10	$43.00
MAR-C60 METAL (METAL CASE) Each	$14.00
MA-C60 METAL Each	$11.00

SONY®

CHF C60	Box of 10	$18.00
CHF C90	Box of 10	$24.00
BHF C60	Box of 10	$24.00
BHF C90	Box of 10	$28.00
AHF C60	Box of 10	$29.00
AHF C90	Box of 10	$39.00

FUJI

FL C60 SUPER LOW NOISE Box of 10	$17.00
FL C90 SUPER LOW NOISE Box of 10	$23.00
FX1 C60 PURE FERRIX Box of 10	$26.00
FX1 C90 PURE FERRIX Box of 10	$31.00
FXII C60 PURE FERRIX Box of 10	$32.00
FXII C90 PURE FERRIX Box of 10	$41.00
MC 60 METAL Each	$11.00
MC 90 METAL Each	$14.50

OPUS

UDC 90 EXTENDED RESPONSE Box of 12	$25.00
G-C90 G-TAPE LOW NOISE Box of 20	$19.00

FURTHER DISCOUNTS AVAILABLE ON PURCHASES OF 10 BOXES OR MORE

ADD: PACK & POST

	1-2 boxes	3-4 boxes	5+ boxes
Within Vic	$1.00	$1.50	$2.00
NSW/SA/TAS	$2.00	$3.00	$4.00
All other places within Aust	$3.00	$3.50	$5.00

To:

MAIL ORDER CENTRE,
A.M.S. SYSTEMS,
135 HAWTHORN ROAD,
CAULFIELD. VICTORIA 3162
PHONE: (03) 528 1149

Stock at prices shown available at time of going to press.

The PCM age starts...

Are your speaker drivers ready for:

- extremely high dynamic range?
- very low harmonic and transient distortion?
- extremely high power handling, continous and transient?

D-28 Dome Tweeter

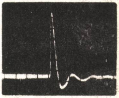
Dynamic range:	better than 127 dB
DIN-power handling in system, crossover 4 KHz - 6 dB/oct.:	1.200 W
Transient power handling, tone burst 10 ms:	900 W
Rise time:	12 us

D-54 Dome Midrange

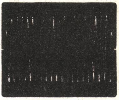
Dynamic range:	better than 127 dB
DIN-power handling in system, crossover 800 Hz - 6 dB/oct.:	1.000 W
Transient power handling, tone burst 10 ms:	1.000 W

21 W-54 8 in Woofer

Dynamic range:	better than 127 dB
DIN-power handling, depending on cabinet construction:	160-210 W
Transient power handling, tone burst 10 ms:	1.000 W
Free air resonance:	31-33 Hz



D-28: Transient response step function



D-54: Tone burst 2 kHz, 10ms-1.100 W.

We use hexagonal wire, ferro fluidics and DTL-system (dynamic transient linearity), pat. reg.: to improve rise time and to reduce IM distortion.

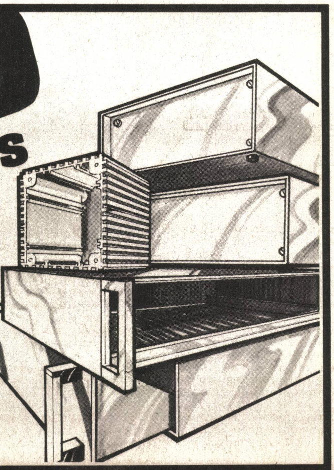
Sole Distributors in Australia DYNAUDIO
P.O. Box 2, Hawthorn, Vic 3122

Available from:
VIC: Soundcraftsmen: 66 Kooyong Road, Caulfield, Vic 3161 Phone: 509-2444
Tivoli Hi-Fi: 654 Glenferrie Road, Hawthorn 3122 Phone: 818-8637
N.S.W.: Leisuresound: 401 Pacific Highway, Artamon, NSW 2064 Phone: 438-4166
387 George Street, Sydney, NSW 2000 Phone: 290-1533

---

vero
metal cases

vero



A large range of Vero metal cases, including D-series half-width cases, the inexpensive Veropak 'Knockdown' type and the Verobox extruded aluminium enclosure.

New from Vero is a chassis for use with Veropak and D cases, a versatile solution to component mounting and wiring.

Warburton Franki can advise you on Vero's Total Packaging Concept. Contact your nearest Warburton Franki office—listed below.

WF **WARBURTON FRANKI**

● ADELAIDE 356-7333 ● BRISBANE 52-7255 ● HOBART 23-1841
● MELBOURNE 699-4999 ● PERTH 277-7000 ● SYDNEY 648-1711

WF629/78

A fresh design approach to a 300W Amplifier

Yes, it's finally happened. We have produced a really high power amplifier. As a prelude to presentation of the full circuit next month, designer Richard Tymerski outlines some of the principles involved in the new amplifier which will deliver 200 watts RMS into 8-ohm loads and 300 watts RMS into 4 ohm loads.

Following the discussion presented in the October 1979 issue concerning the design problems of high power audio amplifiers, this article looks more generally at the desirable features such amplifiers should have and an amplifier design philosophy is expounded.

The ensuing discussion is not only concerned with measures taken to achieve amplifier ruggedness and reliability but also with measures taken to achieve very low distortion, both Transient Intermodulation Distortion (TIM) and Total Harmonic Distortion (THD).

As shown in the October 1979 article, the fact that loudspeaker loads have appreciable reactance dictates the requirements for a large Safe Operating Area (SOA) for the amplifier output transistors. The requirement is such that the load-line of the loudspeaker should not exceed the limits of the SOA. This end can be met by the use of parallel-operated output transistors and load-line limiting.

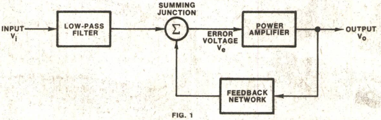


FIG. 1

Due to the power derating at high collector-emitter voltages imposed by secondary breakdown on bipolar devices, paralleling of the output transistors, to increase the SOA, is necessary. The greater the number of output transistors, the greater the power that the amplifier can deliver reliably into the load. Parallel operation relies on current sharing to effect power dissipation sharing. To ensure even current sharing large emitter resistors should be employed. These resistors, however, dissipate some of the power that would otherwise be delivered to the load. Nevertheless, it is important that they should be reasonably large otherwise current "hogging" in individual transistors may occur, thus rendering ineffective the aim for an increased SOA. If the output transistors are arranged in an emitter follower configuration, large emitter resistors also help to provide good bias stability.

To ensure that operation is within the designated limits once a certain SOA has been established, load line or voltage-current (V-I) limited should be employed. It operates by monitoring the voltage across and current through the output transistors and when a potentially unsafe combination is reached, drive to the output transistors is interrupted, thus avoiding possible output transistor destruction. The V-I limiting locus is usually placed just inside the SOA boundaries.

Another provision to ensure the reliability of an amplifier, is that of designing for unconditional stability despite changes in the load. To achieve this, a load stabilising circuit may be used. This circuit serves to keep the amplifier stable in spite of changes in the output load which, in an audio amplifier, are completely out of the hands of the designer, can be extreme and often contribute considerably to poor performance of an otherwise good amplifier.

Equally important as the aim for reliability in a high power amplifier are the requirements for low total harmonic distortion (THD) and low transient intermodulation distortion (TIM). Until recently, it was thought that these two requirements were conflicting but this is not so. It is possible to design an amplifier with very low THD and low TIM.

Let us recap on how TIM is produced. Fig. 1 shows a typical feedback amplifier system. It consists of a low pass filter at the input placed there simply as recognition of the fact that any real life program material that is fed into the feedback amplifier is of limited bandwidth. The cut-off frequency of the input filter is at a frequency designated as F(1). Following this input filter is the feedback power amplifier. It is represented by the power amplifier block in the forward path with a feedback network from the output to the input summing junction. The feedback amplifier has an open loop cut-off frequency at F(0) and it is assumed that the rate of roll-off is first-order, ie, 6dB/octave. Assume also for the moment that the input filter is also first-order.

Now, let us look at the error voltage of the amplifier, ie, Ve, when the input signal, Vi, is a perfect square wave. Let's consider, in particular, the error voltage response to the leading edge of the square wave input. This is depicted in Fig. 2. It shows that an overshoot occurs when F(1) is greater than F(0). There is no such overshoot when F(1) is equal to or less than F(0).

If the overshoot is of sufficient amplitude to overload the input stage of the amplifier, the input signal no longer has control of the output. This blockage of signal may be quite long and during this time, 100% intermodulation occurs. This is known as TIM and is believed to be the reason why some amplifiers featuring excellent THD specifications fail to "audition" well. Much of the harshness previously thought to be due to crossover distortion is now attributed to TIM.

Finnish amplifier designer, Matti Otala (1) has performed a detailed investigation of the error voltage, Ve, for various combinations of the ratio F(1) to F(O) and feedback factor for the system of Fig. 1. His conclusion was that increasing overall feedback made TIM worse. Furthermore, Otala stated that, to obviate the production of TIM an amplifier should be designed for a wide open-loop bandwidth and overall feedback should virtually be kept to a minimum.

Otala's "open-loop" bandwidth specification states that if high fidelity reproduction requires a 20kHz upper

Check out these sophisticated kits from Denmark

JostyKits ... Denmark's finest, offer the kind of innovative design inside and outside that you'd expect from Scandinavia. Created by qualified electronic engineers, they feature solid-state space age technology advanced enough for the most demanding kit builder. Each comes with a comprehensive instruction booklet. Whether you're a novice or experienced builder — JostyKits will give you hours of satisfaction in construction and performance!

VHF (FM) TRANSMITTER

60-148 MHz. Cat HF65. Only **$9.00!**

SHORT WAVE RECEIVER PREAMP

Cat HF 395. Only **$6.00!**

VHF/UHF RECEIVER PREAMP

Cat HF 385. Only **$30.00!**

Audio

AF300 AUDIO AMPLIFIER

A real work-horse, this universal power amp has a wide range of applications such as car radio, record players and small receivers. Due to its well designed electronic circuit, the AF300 can be used over wide voltage ranges without deterioration of the specification parameters.

Kit AF300 — $25.00

AF340 40 WATT AUDIO AMPLIFIER MODULE

High quality 20-20,000 Hz, 37w RMS with low distortion.

Kit AG340 — $35.00

FM Tuners

HF325-2 QUALITY FM TUNER MODULE

The HF325 is a complete high quality FM tuner of professional standing. The tuner unit is ready-made and pretrimmed, making it child's play to assemble. Tuning range 88-108 MHz, operating voltage 12-55 ac. Kit HF325 — $79.00

Stereo decoder HF 310

HF310 FM RECEIVER

The HF310 is a very reasonable priced HF FM tuner. Fully trimmed, the sensitivity according to IHF standards is better than 10uV. Features 60 dB S/N radio and low harmonic distortion.

Kit HF310 — $49.00

HF330 STEREO DECODER

Gives 40-45 dB channel separation, just add to a good quality FM receiver. Kit HF330 — $24.00

Pre-amps (RF)

HF395 RF PREAMPLIFIER

Gain 30dB to 20 MHz, 10 dB to 100 MHz and 5 dB to 226 MHz. Ideal to boost reception on short-wave receivers. Kit HF 395 — $6.00

HF385 VHF/UHF ANTENNA PREAMP

Superb quality with two acrial inputs and one down lead which simultaneously supplies current from the power supply. Frequency range 40-250 MHz and 400-820 MHz. Gain 9-18 dB, depending on frequency. Kit 385 — $30.00. Box B850 — $6.00.

Light Shows

AT465 LIGHT SHOW

Turn your music into light. Simply connect this 3 channel light show to the audio terminals of your amplifier and this quality kit does the rest for you!

Kit AT465 — $64.00

Attractive box and knobs B6065 — $25.00

AT468 4 CHANNEL LIGHT SHOW

This superb kit drives 4 lights (400w per channel) from the audio amplifier output. Kit AT468 — $75.00. Attractive box and knobs B3265 — $48.00

AT365 LIGHT SHOW

This quality kit uses microphone input instead of connection to the audio output. 1599w max.

Kit AT365 — $69.00

Box and knobs B3265 — $48.00

FM Transmitter

HF65 FM TRANSMITTER 60-148 MHz

Will run 5w output with heat sink. Ideal for signal testing of for a miniature transmitter which could be received on a standard FM receiver. Kit HF65 — $9.00.

Receiver Converter

HF305 VHF CONVERTER

Converts FM 105-148 MHz to 105 MHz.

Kit HF305 — $28.00

Box B3405 attractive chassis kit — $24.00

AM Receiver

HF61 MEDIUM WAVE RECEIVER 540-1600 KHz receiver complete with ferrite coil antenna. Kit HF61 - $19.00

Power Supplies

NT415 LAB POWER SUPPLY

0-30V 1 amp well-regulated supply for professional use. Complete with box and transformer.

Kit NT415 — $128.00

NT300 LABORATORY POWER SUPPLY

2-30V High quality supply, regulated 2-30V dc at 2 amps with overload protection. Complete with box and transformer. Kit NT300 — $110.00

Quick assembly kits

JK01	GENERAL PURPOSE AMP 0.5w	$18.00
JK02	MICROPHONE AMPLIFIER	$18.00
JK03	SiNE WAVE GENERATOR 20-20,000 Hz	$30.00
JK04	FM TUNER 88-108 MHz	$30.00
JK05	27 MHz RECEIVER	$33.00
JK06	27 MHz TRANSMITTER	$29.00
JK07	DUAL TONE DECODER FOR R/C MODELS	$43.00
JK08	330Vac LIGHT OPERATED RELAY	$19.00
JK09	SIREN KIT inc. SPEAKER	$19.00
JK10	PHOTOGRAPHIC TIMER 240 Vac	$23.00
JK101	CAR BURGLAR ALARM KIT	$55.00

New Kits

AT347	Electronic Roulette	$54.00
AT350	2 amp triac light controller	$12.00
AT357	Touch-control light dimmer	$33.00
AT356	6 amp AC regulator	$27.00
MI-360	Multivibrator, sq. wave to 10MHz	$6.00
SY-310	15w stereo amplifier kit	$230.00
SY-340	37W stereo amplifier kit	$289.00

VICOM

Mail Orders: Direct to VICOM, 68 Eastern Rd.,
Sth. Melbourne. Vic. 3205. **Enclose $1 extra** for handling and postage costs.

JostyKits are now available from:

Sydney: Vicom,
339 Pacific Hwy, Crows Nest
Ph 436 2766
Radio Despatch Service,
869 George St, Sydney.
Ph 211 0816
Customs Communications,
Parramatta, Ph 635 6399
Adelaide: Hamtronics,
Goodwood Rd, Kingspark.
Ph 272 8417

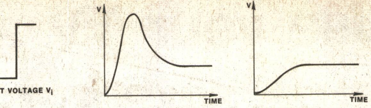
Melbourne: Eastern
Communications,
898 Riversdale Rd.,
Camberwell. Ph 836 8635
Tasman Electronics,
12 Victoria St, Coburg.
Ph 354 5062
Magraths, 208 Lt Lonsdale St,
Melbourne. Ph 663 3736.

Brisbane: Delsound,
1 Wickham Tce,
Ph 229 6155.
CW Electronics,
Marshall Rd, Tarrgindi.
Ph 48 6601.
Perth: Willis Electronics,
993 Hay St,
Ph 321 7609

Adelaide 43 7981
Gold Coast 32 2644
Geelong 78 9660
Rockhampton 28 2843
Wagga 21 2125
Hobart 43 6337
Cairns 54 1035
Launceston 44 3882

Launceston 31 7075
Launceston 31 5815
Brisbane 38 4480
Wellington (N.Z.) 28 7946

cut-off frequency in an amplifier, the amplifier should reach it without feedback, ie, F(0) should be equal to at least 20kHz. And so it has been along these lines that a number of amplifiers purporting to feature low TIM have been designed.

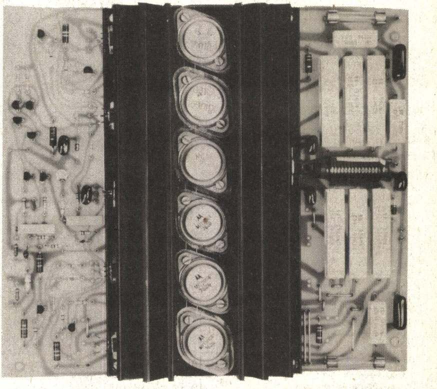


INPUT VOLTAGE V_i

ERROR VOLTAGE V_e $F_1 > F_0$

ERROR VOLTAGE V_e $F_1 \leq F_0$

FIG. 2



Rugged, reliable and easy-to-build, this amplifier will be featured next month.

In order that these amplifiers have wide open-loop bandwidths and low overall feedback, local negative feedback in the amplifier stages is employed (usually in the form of emitter degeneration). This also results in giving the amplifier a good linear open-loop characteristic and with the modest amount of overall feedback, THD is reduced to an acceptable level. However, large over-all feedback is more effective in reducing THD than repeated use of local feedback with a modicum of overall feedback.

More recently, a design philosophy which permits large overall feedback without jeopardising TIM performance has been developed by Peter Garde (2). His approach relies on designing the input stage of the feedback amplifier with a sufficient overload margin, such that any realistic input signal to the amplifier will not cause TIM.

The overload characteristic of the input stage is directly proportional to the stage operating current and inversely proportional to the stage transconductance (ie, gain expressed in amps/volt). Therefore, for a sufficient overload margin, the first stage is designed with a greater than usual operating current and a low transconductance. This low transconductance may be achieved by emitter degeneration of the bipolar transistor stage or by employing JFETs, as they have an inherently low transconductance characteristic.

Whichever approach is used, provided a low transconductance input stage with generous overload margin is used, considerable overall feedback can be applied to the amplifier to achieve very low orders of THD while still maintaining freedom from TIM.

If "lag" compensation is employed to achieve amplifier stability, the above measures, used to achieve an adequate overload margin also increase the Slew Rate capability of the amplifier. In fact, the requirement for the prevention of TIM also relates to the amplifier Slew Rate and the nature of the input signal.

If we define the term, Signal Slope, as the "maximum rate of change of signal voltage with respect to time" then to avoid Slew Rate limiting, the Slew Rate capability of the amplifier should be greater than the output Signal Slope of all possible signals the amplifier will handle.

Note that limiting the bandwidth of program material reduces the maximum signal slope. Therefore, it is advantageous to have a filter at the input (if the program material has a wide bandwidth). It should also be noted that the maximum signal slope from a first order low pass filter is directly proportional to its corner frequency. Therefore, for a given maximum input voltage input (ie, the input voltage at which the amplifier output stage starts to clip) the maximum signal slope is limited to that resulting from a 20kHz corner frequency (which is the lowest applicable to high fidelity amplifiers).

If however, we adopt a second-order filter (with Bessel alignment) with identical -3dB frequency to the first order filter, we find that the maximum Signal Slope is about half that of the first-order filter.

The second-order filter also offers greater cancellation of treble boost from tone controls, which tend to worsen TIM. Thus, we see that this approach has merit considering the cost and the ease of implementation in the amplifier design.

Let us now summarise all that has been said above. We have seen that to ensure amplifier ruggedness and reliability consideration must be given to the nature of loudspeaker loads and an appropriate number of output transistors should be used. When these transistors are operated in parallel, reasonably large emitter resistors should be employed to ensure equal current sharing. V-I limiting and load stabilisation can further enhance reliability. To achieve very low dynamic (TIM) and static (THD) distortion performance in an amplifier we have seen that large overall feedback can be used when due attention has been paid to the design of the amplifier input stage. This stage should be operated at a reasonably high current and feature low transconductance. The inclusion of an input filter reduces the maximum Signal Slope fed to the amplifier and this lowers the dynamic distortion. The lower Signal Slope from a second order filter makes it preferable to a first order filter.

Next month we will present the full circuit and constructional details.

REFERENCES:

(1) Otala, M., "Transient Distortion in Transistorised Audio Power Amplifiers", Transactions IEEE, Vol. AU-18, No. 3, September 1970, pp234-239.

(2) Garde, P., "Transient Distortion in Feedback Amplifiers", Proc. IREE, Vol. 38, No. 10, October 1977.

Use your TV as a large screen oscilloscope

with this simple TV CRO adaptor

Here is a low cost instrument that will interest beginners and enthusiasts alike. It is a plug-in adaptor that converts any TV into a useful low frequency oscilloscope. Using only a few ICs it can display signals from 10Hz up to 300kHz with a sensitivity of 100mV rms for full-screen deflection.

by RON DE JONG

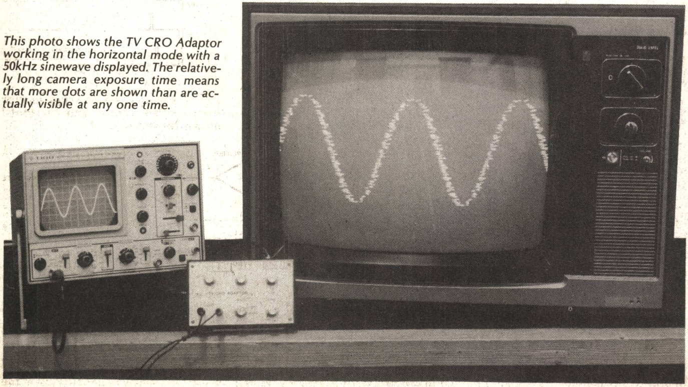
For anyone interested in electronics an oscilloscope is probably the single most useful instrument around. It measures everything from signal voltages to waveforms and frequency in one go. The bad news is that even a modest CRO is expensive and the cost of parts for an oscilloscope also make a project unattractive. For this reason we decided to produce a low cost TV/CRO adaptor. This is simply an adaptor which converts any TV into a low frequency, large screen oscilloscope.

The idea is not new. In fact, we first produced such an adaptor back in March 1963 and circuits along similar lines have been published in other magazines. This design is completely new and has a frequency response up to 300kHz, which far exceeds the limit of a few hundred hertz for other designs. It also connects directly to the aerial inputs of the TV, making it easy to install. Alternatively, for an even better display, it has a composite video output for direct connection to the TV video input stages.

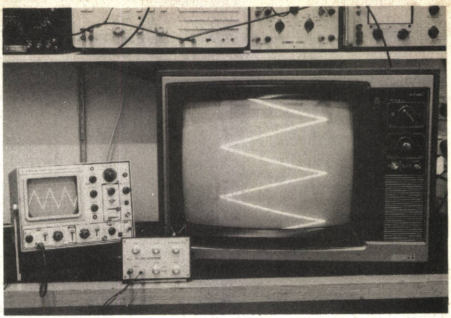
While it cannot compete with a conventional CRO with a bandwidth of several megahertz it does give a good display at the lower frequencies and it will be very useful in such applications as hifi and audio. For example square waves can be fed into an amplifier or a tape deck and the output displayed to check for frequency response, distortion, tape dropout and wow and flutter. The large size of the screen means that the adaptor could also be used as a dramatic display for large audiences or as a monitor for stereo systems.

As you might expect the adaptor works quite differently from a conventional CRO. Rather than deflecting the electron beam in response to the input signal the adaptor merely relies on the normal deflection system of the TV and, in effect, turns on the beam when it is in the correct position on the screen.

Now in a normal television set the whole screen is scanned 50 times a second. Each scan is called a field and



This photo shows the TV CRO Adaptor working in the horizontal mode with a 50kHz sinewave displayed. The relatively long camera exposure time means that more dots are shown than are actually visible at any one time.



The TV CRO Adaptor working in the vertical mode, this time with a 150Hz triangle wave displayed. This mode is best used to display low frequency signals.

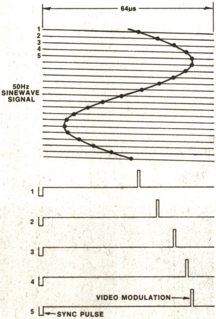


FIG. 1

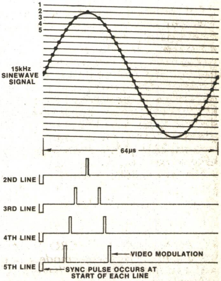


FIG. 2

Figs. 1 & 2 illustrate how the adaptor works in the vertical and horizontal modes respectively.

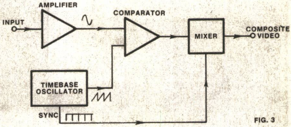


FIG. 3

Fig. 3: general operation of the TV CRO Adaptor. The input signal is compared with a timebase signal and mixed with the timebase sync pulses to produce a composite output.

consists of 312.5 horizontal lines, so the field frequency is (50 x 312.5) 15,625Hz. To keep the circuitry of the adaptor simple either of these two frequencies must be used as the timebase for the display. We have used both and the result is that two distinct display modes are available; the vertical mode and the horizontal mode.

These two display modes can be seen from the accompanying photographs. In the vertical mode the signal is displayed sweeping from top to bottom and in the horizontal mode the sweep is from left to right as in a conventional CRO. The reason for having the two modes is that the vertical mode is best used to display low frequency signals, while the horizontal sweep mode, is better for displaying higher frequency signals.

The situation is clarified in Fig. 1 and Fig. 2 which illustrate the vertical and horizontal modes respectively. Looking at the vertical mode first, a complete cycle of a 50Hz sine wave signal is shown superimposed on a sequence of lines representing the path of the electron beam across the television screen. The small dots where the two cross over are the points or dots which actually appear on the screen.

The adaptor generates these dots by sampling the input signal during each line scan. This sampled voltage is compared to a sawtooth voltage which increases linearly from the start of each line. When the sawtooth voltage equals the sampled voltage a brief video pulse is generated. This means that the higher the input voltage at the instant of a particular line scan the later the pulse will occur and the further to the right of the screen the dot will appear. This occurs for each line scan so that at the end of a field a complete picture of the waveform is built up.

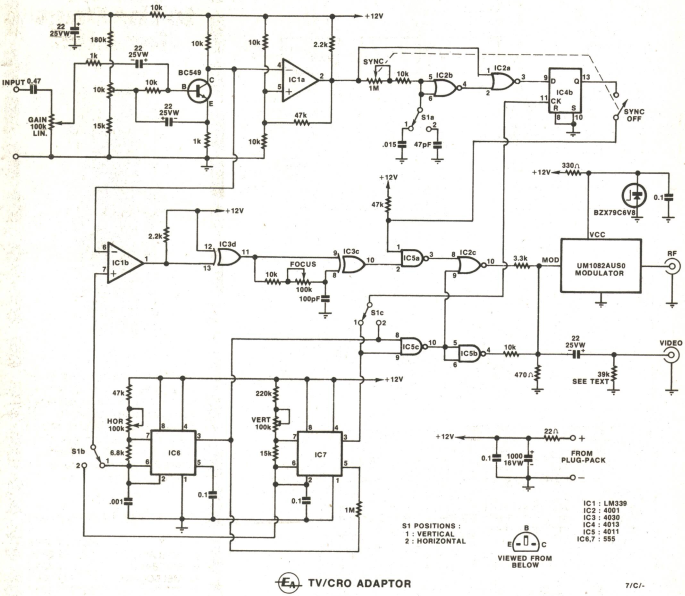
Video signals generated by the adaptor in the vertical mode can be seen in Fig. 1, line for line as they appear on the screen. Each line is 1/15,625s or 64us long and starts with a negative sync pulse 5us long, while the video pulses corresponding to the white areas on the screen are high.

The operation of the adaptor in the horizontal mode is shown in Fig. 2 which shows a sine wave signal as it would be displayed in the horizontal mode.

Fig. 3 shows the general operation of the adaptor, as described above. A timebase signal, from the vertical or horizontal oscillators, is compared with the input signal in a comparator which produces pulses whenever the two waveforms coincide. These video pulses are then mixed with the timebase sync pulses to produce a composite output.

It should be noted at this point that in both the horizontal and vertical modes we assumed in our description that the input signal was locked either to the line or field frequencies resulting in a static display. For most cases, though, the input will not be locked and the display will appear to shift up or down in the vertical mode, while in the horizontal mode it would appear to "tear". This may not be important in the vertical mode but some sort of synchronism is clearly necessary in the horizontal mode.

This is provided by the sync circuit shown in the block diagram of Fig. 4. Firstly a zero crossing detector is used to generate a brief pulse at the start of each cycle of the input waveform. This signal is checked against the line sync pulses so if a new cycle starts just at the



The circuit works as a "sampling" oscilloscope by comparing the input waveform with the horizontal or vertical timebase.

beginning of a line scan the video signals will be allowed to pass through during that line. This ensures that only those lines which are in sync with each other will be displayed and a coherent picture of dots, rather than a continuous trace, will be displayed.

Synchronisation is also available in the vertical mode, though it is not as useful. In this case, if the waveform is to appear stationary the input signal must start from the same place at the beginning of each field. The sync circuit checks the signal from the zero crossing detector against the field sync pulse and if a cycle of the input waveform has just started then the video will be enabled for the rest of the field. In practice the result is a strobing effect with the waveform flashing up only occasionally.

Now refer to the circuit diagram to see how we have implemented these ideas. Input to the adaptor is via a simple bootstrapped transistor amplifier. The amplifier provides a gain of about 10 and the bootstrapping capacitor between emitter of Q1 and the wiper of the 10k trimpot provides an input impedance for the stage of around 100k. Together with 100k gain control, the input impedance is better than 50k. The 10k trimpot sets the quiescent output voltage of the stage and effectively acts as a shift control, moving the oscillograph either up and down or sideways depending on the display mode.

IC1b is the comparator shown in Fig. 3. It is fed with the amplified input signal and the sawtooth waveform obtained via switch S1b which selects either the vertical or horizontal sawtooth waveforms, depending on the mode. When the input signal exceeds the sawtooth waveform the output of the comparator will be low; if it is less than the sawtooth the output will be high. The important point to note though, is that at the instant the two voltages are equal the output of the comparator will swing either high or low.

This transition at the output of the

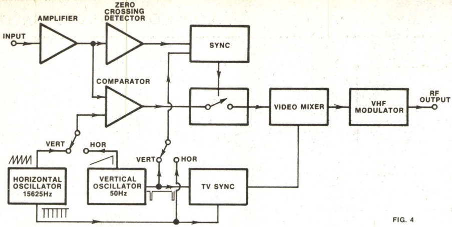
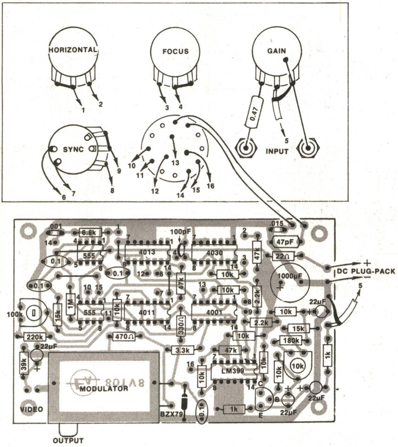


FIG. 4

Fig. 4: block diagram of the final TV CRO Adaptor circuit.



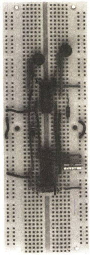
Follow this wiring diagram in conjunction with the circuit.

comparator must now be converted to a brief positive pulse which is the video signal, or the spot which appears on the screen. This is accomplished with IC3d and IC3c which are both exclusive-OR gates. IC3d buffers the output of the comparator and then drives one input of IC3c directly, and the other via a simple RC delay circuit consisting of a 100k potentiometer, a 10k resistor and 100pF capacitor.

When the output of the comparator changes state, the signal at one input of IC3c will be slightly delayed so for the period of the delay the two inputs will be different. The output of an XOR (exclusive-OR) gate is high only while its two inputs are different, hence a brief positive pulse will be generated by IC3c and the width of the pulse or the length of the dot on the screen is equal to the delay. This is controlled by the 100k potentiometer and for lack of a better name we have called it a "focus" control.

Referring back to the block diagram, Fig. 4, the video signal now passes to gate IC5a which is controlled by the sync circuit. Pin 2 of IC5a is the video input while pin 1 is the sync input. If pin 1 is high the video signal will simply be inverted by IC5a but if it is low the output of IC5a will always be high, effectively blocking the video signal. The

Socket to the Bugs for Life.



The highest quality socket in the industry now carries a new low price and a new lifetime guarantee. E&L guarantees the SK-10 socket against all failures. Should it ever break, be damaged or fail to perform as described, return it to us postpaid for a free replacement.

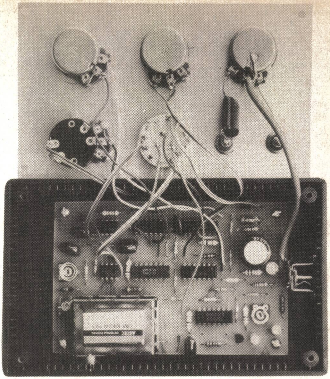
Available interstate from:-

● A.C.T.	(062) 82 4995
● ADELAIDE	(08) 42 6655
● BRISBANE	(07) 277 4311
● MELBOURNE	(03) 277 0600
● PERTH	(09) 275 2377
● NEWCASTLE	(049) 69 1625
● WOLLONGONG	(042) 29 1455

AVAILABLE NOW FROM

ELECTRONIC DEVELOPMENT SALES PTY. LTD.

92 Chandos St,
St. Leonards
2065.
Phone: 438 2500
438 2412
Telex AA 25963



ABOVE & RIGHT: the completed prototype. The unit may be powered either from a 9V battery or from a plugpack power supply.

PARTS LIST

- *1 plastic utility box, 150 x 90 x 50mm (D x H x W)*
- *1 Scotchcal front panel*
- *1 PC board, 80TV8, 122mm x 77mm*
- *1 UM1082AUS0 TV modulator*
- *1 9 volt DC plug pack*
- *1 2.1mm battery adapter socket*
- *3 100k (linear) rotary potentiometers*
- *1 1M (log) switch potentiometer*
- *1 3-pole 2-position rotary switch*
- *1 black binding post*
- *1 red binding post*
- *1 10k miniature horizontal trimpot*
- *1 100k miniature horizontal trimpot*
- *½-metre rainbow cable*
- *4 15mm board supports*

SEMICONDUCTORS

- *1 LM339 IC*
- *1 4011 CMOS IC*
- *1 4001 CMOS IC*
- *1 4030 CMOS IC*
- *1 4013 CMOS IC*
- *2 555 ICs*
- *1 BC549 transistor*
- *1 BZX79-C6V8 zener diode*

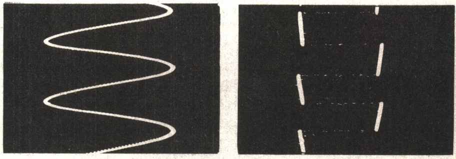
CAPACITORS

- *1 1000uF/16VW PC electrolytic*
- *4 22uF/25VW electrolytics*
- *1 0.47uF greencap (metallised polyester)*
- *4 0.1uF greencap*
- *1 0.015uF greencap*
- *1 .001uF greencap*
- *1 100pF ceramic or polystyrene*
- *1 47pF ceramic or polystyrene*

RESISTORS (all ¼ watt 5%)

1 x 1M, 1 x 220k, 1 x 180k, 3 x 47k, 1 x 39k, 2 x 15k, 8 x 10k, 1 x 6.8k, 1 x 3.3k, 2 x 2.2k, 2 x 1k, 1 x 330 ohm, 1 x 22 ohm.

NOTE: Ratings are those used on the prototype. Components with higher ratings may generally be used providing they are physicially compatible.



These photos show vertical mode 150Hz sine and square wave displays.

sync signal is disabled by the "sync off" switch and the 47k pull-up resistor.

The sync circuit consists of IC2b, IC2a and IC4b plus the zero crossing detector IC1a. The detector is a Schmitt trigger which squares up the signal to a level suitable for the following sync circuits. We have used a Schmitt rather than a common amplifier configuration because it results in a much cleaner signal, which is important as far as the sync is concerned.

Output from the detector is then fed to a delay circuit similar to that used in the video circuit. The period of the delay is set by the RC circuit consisting of a 1M potentiometer, 10k resistor and two capacitors which are selected via switch S1a. IC2b buffers and inverts this delayed signal which is then fed along with the signal to IC2a which is a NOR gate. The output of this gate is a brief positive pulse whenever a new cycle of the input waveform starts.

The purpose of the sync circuit, as we have already discussed, is to check that this "trigger" signal is present at the start of each line in the horizontal mode and each field in the vertical mode. This is accomplished by IC4b which is a D-type flipflop. The flipflop functions as follows: when the clock signal goes high, the signal at the data input is transferred to the output.

The clock signal for the flipflop, IC4b, is either the horizontal or vertical sync pulse depending on the display mode, while the data input is the signal from IC2a. If a cycle of the input waveform has just started the IC2a signal will be high for a time given by the 1M sync potentiometer and if a line scan begins during this time the flipflop will transfer the IC2a signal to its output. The video signals will then be "enabled" for the remainder of the line via IC5a.

If the signal from IC2a is long then more cycles of the input will be accepted so the display will be less fragmented. Unfortunately this also causes the display to be less coherent so there is a definite tradeoff. To get the signal lengths in the "ballpark" the mode switch S1a selects different

Direct video to your TV set

Some constructors may wish to use a direct video connection for an improvement in picture quality, although note that all our photographs were taken using the modulator output. One other advantage of a direct video connection is that there is less chance of interference to other TV sets in the vicinity.

The easiest approach is to connect the video output from the adaptor to the input of the video amplifier in the TV set; ie, immediately after the video detector. If you have access to the circuit diagram of the set you should be able to find the appropriate spot in the circuit without any trouble. Ideally, the circuit will also show the shape and amplitude of the composite sync/video waveform which is normally present at the input to the video amplifier stage.

For example, in a small valve portable TV set we modified for this purpose, the composite sync/video waveform is normally 2 volts peak-to-peak with positive video and negative sync. This is in the right ballpark for the adaptor, which has a composite sync/video amplitude of 1.6 volts peak-to-peak. All that we did was to connect the video from the adaptor to the grid of the video amplifier valve.

Much the same approach applies to solid state sets. Find the video detector and check the video waveform. Provided its polarity is correct and the amplitude is in the ballpark, you can feed the adaptor video signal into the base of the following video amplifier stage as before.

The TV set tuner is set to an unused channel. This means that no video modulation is present from within the set. The video signal will swamp the noise to produce a sharp display.

The polarity of the electrolytic coupling capacitor must be correct and it must have low leakage to avoid upsetting the bias of the following stage.

By suitably adjusting the brightness and contrast controls, a bright and steady display is obtained. The 39k resistor on the video output of the adaptor may not provide suitable bias for some TVs so the actual value is a matter of experimentation. On some sets you may have to remove the 39k resistor altogether.

All the foregoing assumes that you have a set with earthed chassis and transformer isolation from the mains supply. If not, you will just have to use an RF modulator.

Some other sets which have a separate sync detector will not be suitable for the above method of video connection. In these cases it may be possible to connect the sync and video from the adaptor separately, rather than use the composite waveform.

It is possible that the polarity of the video waveform within your set is reversed to that from the adaptor. This will result in poor or incorrect picture sync and a negative (ie, reversed) picture. The solution in this case is to build a single-stage common-emitter amplifier which will provide the necessary waveform polarity reversal.

Finally, if you propose to use an old set for which no circuit diagram is available, it is usually possible to identify the video amplifier relatively quickly. Just take note of the single wire from the picture tube socket which is the video output. Trace this back to the appropriate valve. From there it should be easy to identify the grid. This can be done by measuring voltages — the grid will usually be a few volts negative with respect to chassis.

The same approach would apply to solid state black and white TV sets. The video output transistor can be found by tracing the video output lead to the picture tube, back to its source. From there it's a matter of identifying the base of the transistor and then feeding the signal in as before.

---

delays, longer for the vertical mode and shorter for the horizontal mode.

So far we have discussed the video and sync circuits but not the horizontal and vertical oscillators. Both oscillators, IC6 and IC7, are 555 astable multivibrators, which are identical except for different frequency determining components. The sawtooth waveform is generated at pins 2 and 6 where the timing capacitor is alternately charged via the pull-up resistors and discharged via pin 7. The sawtooth waveforms are slightly non-linear because of the simple RC circuit used but this has only a minor affect on the performance. The output at pin 3 is used to derive the sync pulses for the video signal.

If the video display is to remain stable the vertical and horizontal oscillators must be in synchronism. This is achieved by connecting the output from pin 3 of the horizontal oscillator, IC6, to the control voltage pin of the vertical oscillator, IC7, via a 1M resistor. The two sync signals are then mixed together by NAND gate IC5c. The combined sync is used to blank the video signals during sync pulses to prevent any interference. Video and sync pulses are finally mixed together by the resistive divider comprised of 3.3k, 10k and 470 ohm resistors. This gives a composite video output of about 1.6V p-p.

As well as being fed to an output socket, the composite video output is fed to the input of a commercial VHF TV modulator, the Astec type UM1082AUS, made in Malaysia and imported by Dick Smith Electronics. This is housed in a small metal box and is aligned to Australian TV channel 0. Output impedance of the modulator is 75 ohms unbalanced which makes it suitable for connection to the antenna coax socket on most colour TV receivers.

Power for the TV CRO Adaptor is derived from a plugpack power supply capable of delivering 9 to 12 volts DC at up to 100mA or more. The output of the plugpack is fed through a filter consisting of a 22-ohm resistor and 100uF capacitor. The VHF modulator is run from a zener diode regulator network, at 6.8 volts. Note that the unit may also be run from a single 9V battery. Current consumption is about 10 milliamps.

CONSTRUCTION

We constructed our adaptor in a plastic utility box measuring 150 x 90 x 50mm. All the circuitry, except for switches and components, is mounted on a printed circuit board (PCB) measuring 122 x 77mm and coded 80tv8.

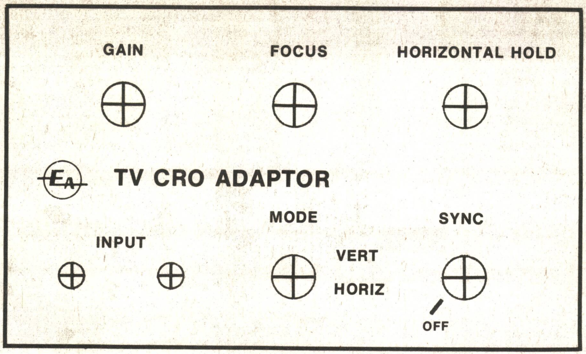
We suggest mounting the links and small components on the PCB first, leaving the CMOS ICs and modulator till last.

Take the usual precautions when soldering the CMOS ICs: avoid handling the pins; use a soldering iron with

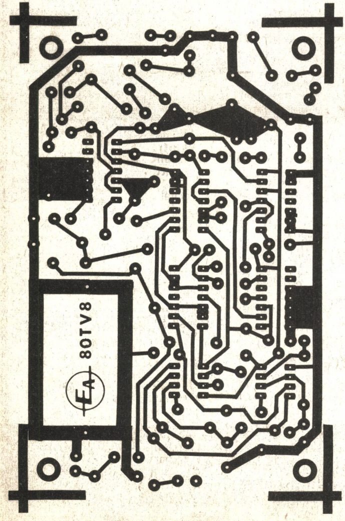
We estimate that the current cost of parts for this project is approximately

$25

This includes sales tax but does not include the plugpack power supply or battery.



Here are actual size artwork for the front panel and the PC board.



the barrel connected to one of the supply rails on the PCB; and solder the supply pins first. This allows the internal protection circuitry of the CMOS ICs to prevent damage from static charges.

The last step in assembly of the PCB is to solder the modulator in place.

Drill the front panel of the utility box using the front panel artwork, featured in this article, to obtain drilling centres. The artwork can also be used to produce an adhesive Scotchcal panel. Alternatively, you can obtain a finished Scotchcal panel from Radio Despatch Service, 869 George Street, Sydney or from Rod Irving Electronics, 499 High Street, Northcote, Melbourne.

The front panel input sockets are connected to the PC board via shielded audio cable to prevent signal pick-up from the oscillators. Note also that the aluminium front panel must be connected into circuit by soldering a link from the shield connection on the 100k gain potentiometer to the back of the potentiometer. Use the wiring diagram to complete connections of the switches, potentiometers and sockets.

The adaptor can now be "fired up". Connect the output of the modulator to the TV via a 75 ohm coaxial cable using an RCA plug at the adaptor end and a Belling Lee coax plug at the other end. Use a 75 to 300 ohm balun if a B/W TV without the necessary 75 ohm input is used. Switch the TV channel selector to channel 0 and with the adaptor in the vertical mode and sync off adjust the horizontal hold on the adaptor for a stable picture.

With a suitable input signal applied a display should now appear. It only remains to practice using the various controls such as sync and focus to obtain the best displays.

Just one final note about using the adaptor: When using the unit in the vertical mode, you may be tempted to turn your TV on its side for a more convenient viewing angle. For many TV sets this is permissible but the smaller portable valve sets do not have generous ventilation and may overheat when turned on their sides.

Well now, we are sure that many readers will agree that this adaptor is a good way of putting that old B&W set into use. Why not go ahead and put it together?

ROD IRVING ELECTRONICS

499 HIGH STREET, NORTHCOTE 3070, MELBOURNE VICTORIA. Ph. (03) 489 8131.

NEW PRODUCTS

JUST WRAP™

- 30 AWG wire
- Daisy chain or point-to-point
- No stripping or slitting required—just wrap
- .025" square posts
- Built-in cut off
- Includes 50 ft. wire

Part No.	Wire Color	Price
JW-1-B	Blue	$24.99
JW-1-W	White	24.99
JW-1-Y	Yellow	24.99
JW-1-R	Red	24.99

JUST WRAP™ Replacement Wire

Part No.	Color		Price
R-JW-B	Blue	50 ft. roll	$4.99
R-JW-W	White	50 ft. roll	4.99
R-JW-Y	Yellow	50 ft. roll	4.99
R-JW-R	Red	50 ft. roll	4.99

INTERSIL ICL7106 LCD EVALUATION KIT

$32.50

SCOTCHCAL FRONT PANELS FOR ETI & EA PROJECTS:

ETI 452 Guitar Practice Amp	$4.80
Series 4000 Any colour	$12.50
MOVING Coil Pre Amp	$2.00
577 Power Supply	$2.00
455 Loud speaker protector	$2.70
Variable power supply	$2.70
Linear ohmeter	$2.50
Muscle activity meter scale	$1.40
ETI 576 Electromyogram	$2.80
561 Metal Detector	$2.50
EA Capacitance meter	$3.50
EA Flash exposure meter	$4.25
EA Sound triggered flash	$3.50
EA Slave flash	$1.20
EA Playmaster graphic analyser	$8.50
EA Metal Detector 79md9	$3.90
EA Pulse generator	$4.80
EA Square wave oscillator	$2.50
EA RF Z Bridge	$3.25
EA Thyristor tester	$2.40
EA Quartz frequency ref.	$2.70
EA Multi monitor	$1.90
EA Experimenters Supply	$2.80
EA Quiz master	$3.70
EA Variable wiper delay	$1.10
EA Playmate stereo Amp	$4.50

ALL FRONT PANELS AVAILABLE FROM DAY OF RELEASE OF MAGAZINES. WHEN ORDERING FRONT PANELS, SPECIFY COLOUR OF LETTERING FIRST, THEN COLOUR OF BACKGROUND.

CRYSTALS

FREQ (MHz)	HOLDER	PRICE
1.00	HC33	$12.50
2.00	HC33	$10.90
3.00	HC18	$7.90
4.00	HC18	$4.90
5.00	HC18	$4.90
6.00	HC18	$4.90
8.00	HC18	$4.90
10.00	HC18	$4.90
11.00	HC18	$4.90
12.00	HC18	$4.90
15.00	HC18	$4.90
16.00	HC18	$4.90
18.00	HC18	$4.90
20.00	HC18	$5.50
24.00	HC18	$5.50
27.00	HC18	$5.50

Full list of Crystals and prices available on application.

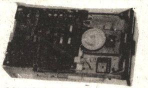
COMPONENTS

4116 RAMS	$10.00
2114 RAMS	5.50
2708 EPROM	8.50
741's 10 up	2.50
555's 10 up	2.90
BD139 10 up	2.50
BD140 10 up	2.50
SC141D 10 up	11.00
SC151D 10 up	21.10
RED LEDS 10 up	1.40
RED LEDS 100 up	11.00
YELLOW LEDS 10 up	2.30
8 PIN I/C SKTS 10 up	2.00
BC547 10 up	1.00
BC548	0.15 ea.
BC549	0.19 ea
MJ802	3.60
6,800/50V CAPS (LUG)	4.50
5,600/40V CAPS (PCB)	1.90

KITS & CIRCUIT BOARDS

ETI SERIES 4000 AMP

- Complete Kit $179.00
- Quality front panel to suit above $9.90
- ETI 470 kit of parts 19.90
- ETI 480 kit of parts 100w (incl. bracket) 19.75
- ETI 470 PS kit of parts ... 19.50 (includes relay, not transformer)
- Transformer to suit 22.90
- ETI 471 pre-amp 45.50
- ETI 585R ultra sonic RX .. 15.95
- ETI 585T ultra sonic TX ... 8.95
- EA 79 SF9 sound flash trigger 15.00
- All parts available for DREAM computer project.
- P.C.B.'s (all quality fibreglass boards)
  - ETI 574 disco strobe 2.80
  - ETI 549A metal detector .. 2.75
  - DREAM circuit board 10.90



SCHUGART SA 400
5in Minifloppy Drive
$379.50 Tax Inc
$330.00 ex

RITRON COMPUTER GRADE P/S
+5V reg 10a ± 16V unreg @ 1A.
KIT $79.95 inc
Built and tested $99.50

RITRON
8 Slot Motherboard
Kit $65.90
Built and Tested $80.00

INTERSIL LCD 3½ DIGIT PANEL METER KITS

Build a working DPM in ½-hour with these complete evaluation kits.
Test these new parts for yourself with intersil's low cost prototyping kits complete with A/D converter and LCD display (for the 7106) or LED display (for the 7107). Kits provide all matrials including PC board, for a functioning panel meter ICL7106EV (LCD).

COMPUTER COMPONENTS

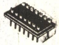
Attention Sorcerer & TRS 80 owners. Memory expansion kits available. We also offer full service on the popular computer projects and systems.

SPECIAL 4116 RAM OFFER
8 OFF PRIME SPEC 4116 I/Cs $79.00
16 4116s for $155.00
STATIC RAM KIT 16K S-100

KIT FORM	**$239.00**
ASS & TESTED	**$269.00**

All front panels available for ETI &EA projects in scotchcal from July '79. Phone for details.

DIP PLUGS



Ideal for use with flat ribbon cable or to mount components on

14 pin $0.60	24 pin $1.20
16 pin $0.70	40 pin $4.00

POWER TRANSFORMERS

SPECIALLY DESIGNED FOR MICROCOMPUTERS

- Good regulation electrostatic shield
- RI 805 8V @ 5A 2x15V @ 1A $21.50
- RI 810 8V @ 10A 2x15V @ 1A $22.50
- RI 820 8V @ 20A 15V @ 1A 15V @ 3A $35.50

20 TURN CERMET TRIM POT

SPECTROL 43P ACTUAL SIZE

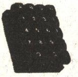
STOCK RESISTANCE VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M.

1—9	$1.30
10—99	1.20
100	1.10

Values may be mixed.

Hexadecimal Keypad

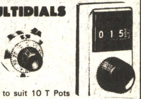
$21.50/each



19-key pad includes 1-10 keys ABCDEF and 2 optional keys and a shift key.

Ideal for dream project

MULTIDIALS



Dials to suit 10 T Pots

Model 21 1.8" dia	$10.90
Model 16 9" dia	$11.50
Model 18 1" x 1.75" dia	$19.50

COMPUTER COOLING FANS

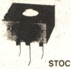
Muffin fan 4⅝" square

110V	**$26.50**
240V	**$24.50**

Sprite fan 3⅛" square

110V	$26.50
240V	$24.50

Range of larger fans available. Send for details.



cermet single TURN TRIM POT

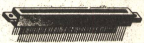
Spectrol model 63P
ACTUAL SIZE

STOCK VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 200K, 500K, 1M, 2M.

1—9	$1.00
10—99	0.90
100	0.80

Values may be mixed.

P.C. EDGE CONNECTORS



S100 gold plated wire wrap	**$6.50**
S100 solder tail	**$5.90**
D2 Motorola bus	
43/B6 solder tail	**$6.34**
43/86 gold plated wire wrap	**$7.40**

DREAM

ELECTRONIC AUSTRALIA MICROCOMPUTER PROJECT

Kit for main board (including programme 2708) $115.00
Also available re-designed 6802 PCB $11.90

PCB (fibre glass) only	$10.90
2708 programmed	$15.50
Key Pad 19 keys	$21.50
Kit (less key pad)	$90.00
PCB for power supply	$3.50

10 TURN POTENTIOMETERS

Stock resistance values

50R, 100R, 200R,
500R, 1K, 2K, 5K,
10K, 20K, 50K,
100k.

Spectrol model 534 ¼" shaft.

Price 1—9	$6.50
10 + values may be mixed	$5.95

HEAVIER ITEMS ADD ADDITIONAL POSTAGE EXTRA HEAVY ITEMS SENT COMET FREIGHT ON
PRICES SUBJECT TO CHANGE WITHOUT NOTICE. SEND 60c & SAE FOR FREE CATALOGUE

MAIL ORDERS: PO BOX 135, NORTHCOTE, VIC 3070.
MIN PACK & POST $1.25 PRICES CURRENT UNTIL 7th JUNE 1980

A zero-voltage switching heat controller

for minimum electromagnetic interference

Winter is almost upon us and with it the problem of keeping warm without sending the power bill soaring. This versatile zero-voltage switching heat controller provides continuously variable control of heating appliances without the radio interference problems common to more conventional phase control circuits.

DESIGN by JOHN CLARKE

While the Triac has proved a boon for light dimmers and in many other power control applications, conventional phase-controlled Triac circuitry generates considerable electromagnetic interference. By contrast, this zero-voltage switching power control circuit does not generate interference and is suitable for controlling radiators and other heating appliances.

Conventional phase-controlled Triac circuitry controls the power of the AC mains by varying the point at which the Triac is triggered into conduction. For low power operation, the Triac is triggered late in each half-cycle of the AC mains waveform, while for high power, the Triac is triggered early in each AC half-cycle. Fig. 1 demonstrates the principle.

The term "phase-control" refers to the fact that the phase of the Triac trigger pulses is varied with respect to the phase of the AC waveform.

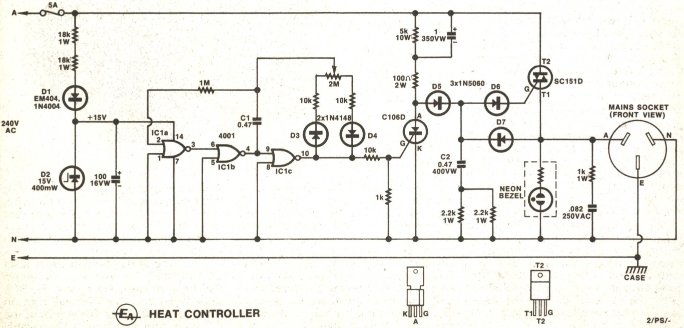
The one big problem with phase-controlled Triac circuitry is that it generates considerable EMI (electromagnetic interference) or, as it used to be called, RFI (radio-frequency interference). By either name, the problem is the same. The EMI occurs because the Triac switches at any point in the AC waveform and thus generates peak currents with very fast rise-times in the load and wiring.

If, for example, the Triac switches at the peak value of the mains waveform, approximately 340 volts positive or negative, the resulting current in a 1000-watt radiator rises to almost six amps in just a few micro-seconds. Since this happens on every AC half-cycle, the resulting high-energy harmonics become an irritating loud buzz when reproduced by broadcast and shortwave receivers.

It is possible to suppress Triac generated EMI but effective suppression is very difficult to obtain over a wide frequency range. It is far better to avoid the problem altogether. This can be done by the technique known as "zero-voltage switching". This method involves turning on the Triac at the zero-crossing point of each AC half-cycle. In this way, the Triac generates negligible interference when it turns on.

The "zero-voltage" switching method also implies that the Triac is turned on for integral numbers of successive AC cycles. For lower power, the Triac is turned on for one full AC cycle with low repetition rate (say, one in 20) while for high power, the Triac may be turned for nine out of ten AC cycles. Fig. 2 demonstrates the process.

Naturally, this method of power control is only suitable for resistive loads such as radiators and other heating



Readily available components make up this zero-voltage switching circuit.

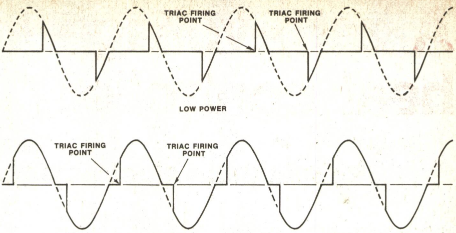


FIG. 1

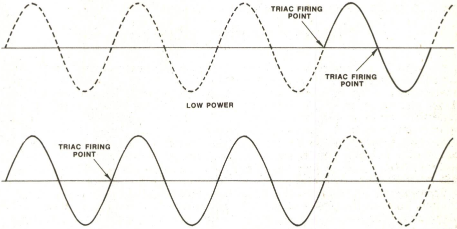
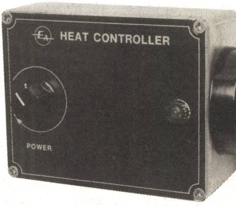


FIG. 2



Figs. 1 and 2, above, show the difference between phase-controlled and zero-voltage switching Triac circuits. At right is the prototype Heat Controller.

appliances. It is not suitable for light dimming because the lights would flash!

Zero-voltage switching Triac circuitry is often designed around special-purpose integrated circuits but our design uses readily available, off-the-shelf components. Our design is based on a circuit originally developed by General Electric and published in that company's SCR Manual which was reviewed in our December 1979 issue.

Now refer to the circuit diagram. Forget the components to the left of the C106D SCR for the moment. The heart of the circuit is the SC151 Triac, the C106D SCR and the diodes D5 to D7. Now consider that the SCR is not receiving a gate signal and so cannot conduct.

At the beginning of a positive AC half-cycle, the voltage at the Triac terminal T2 rises and so feeds a current to the Triac gate via the 1uF capacitor, 100 ohm resistor and diodes D5 to D6. Thus the Triac turns on very early in the positive AC half-cycle.

As the Triac conducts and applies a positive voltage to the load, diode D7 conducts and charges C2. Then, at the beginning of the next AC half-cycle (which happens to be negative) C2 is discharged via D6 into the gate of the Triac to turn it on immediately.

In this way, whenever the Triac is turned on for a positive half-cycle, conduction in the negative half-cycle automatically follows.

So with the three diodes, D5 to D7 and associated capacitors and resistors, the Triac will begin conduction at the beginning of a positive half-cycle and continue until the end of the following negative half-cycle. The silicon controlled-rectifier (SCR) C106D is used to switch the Triac on for integral numbers of AC cycles.

When the SCR turns on, it bypasses any gate current to the Triac which would otherwise flow through D5. If the SCR is switched on at some time during an AC cycle, the Triac will remain in conduction for the remainder of the cycle. However, if the SCR remains on for successive AC cycles the Triac remains off.

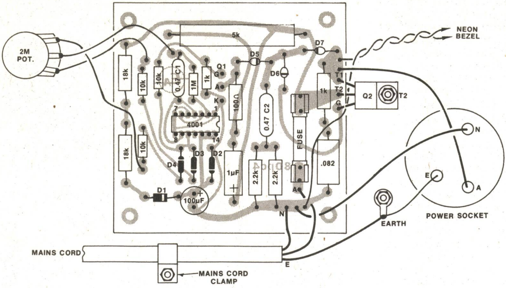
So the means for switching the Triac on for integral numbers of AC cycles is provided merely by feeding a low frequency square wave, of variable duty cycle, to the gate of the SCR. This square wave is generated by a CMOS oscillator comprised of a 4001 quad two-input NOR gate and the components associated with D3 and D4.

Since one input of each NOR gate is tied to the negative supply, the gates actually work as inverters. The three inverters are wired in a variation of a standard triple-inverter oscillator. The time-constant of the oscillator is defined by the value of C1 and the value resistance between C1 and the output of IC1c.

The oscillator works as follows: Since each inverter has a change in polarity between input and output, the capacitor C1 will be charged alternately in one direction and then the other, forcing all the inverters to change state (from low to high or high to low) simultaneously. For example, when the output of IC1c is high and its input is low, C1 will charge towards the positive supply to the point where the input of IC1a is pulled high enough to force all inverters to change state.

When C1 charges towards the positive supply it is fed via diode D3; when charging in the other direction it is fed via D4. Thus it is possible to vary the duty cycle of the generated square wave by changing the setting of the two megohm potentiometer.

When the potentiometer wiper is set at midtrack, the oscillator waveform will be approximately square (ie, 50% duty cycle) and the Triac will turn on for roughly 10 cycles in every 20 of the AC waveform and thus apply roughly half power to the load. The duty cycle



Note that D5, 6 and 7 are controlled avalanche diodes while C2 is rated at 400VW.

of the Triac is indicated by the neon. If it delivers very short bursts of light, then the power delivered to the load is low, and so on.

Note that the oscillator square wave is not synchronised to the mains waveform. Nor does it have to be synchronised because of the nature of the Triac switching circuit which automatically ensures that the Triac switches on for whole AC cycles.

Power requirements of the CMOS oscillator are provided directly from the mains via two 18k dropping resistors, a half-wave rectifier, D1 and a 15V zener diode, D2.

A commutating network consisting of a 1k resistor and .082uF 250VAC capacitor is connected across the Triac to provide reliable switching.

That concludes the circuit description except for one qualification. Because of the Triac gate current requirements of typically 50 milliamps or more, the Triac does not switch at the zero-voltage point at the beginning of the positive half-cycle. The switching voltage is actually closer to 15 volts. While this is not ideal, the EMI delivered by the Triac is negligible compared with a phase-controlled circuit.

APPLICATIONS

Well, what are the uses for this circuit? As we remarked earlier, it is applicable to heating appliances. For example, it can be used to provide continuous heat control for electric radiators. It is particularly handy for reducing the output of a single-bar 1kW radiator, which, when used in a small room, can quickly produce a stifling atmosphere. Our heat controller allows the radiator to be set for a comfortable temperature without power wastage.

Similarly the heat controller can be used with vertical grillers which have no built-in heat control. Normally the only way the cooking temperature of these vertical grillers can be controlled is by opening the side covers to release the heat — a very wasteful and imprecise method.

Then there are the many electric blankets which have only a coarse, two or three position heat control, often either too hot or too cool. Our heat controller can provide a continuously variable temperature setting, so that the user can select just the right amount of warmth.

CONSTRUCTION

We built our heat controller into a diecast box. This provides rugged and safe construction as well as a heat sink for the Triac. Note that plastic boxes cannot be used for this project.

The circuit is rated for loads up to

PARTS LIST

1 PCB coded 80pc4, 88mm x 87mm
1 diecast aluminium box, 118 x 93 x 56mm, Eddystone 6908P or similar
1 neon bezel
1 mains socket
1 mains plug and three core flex
1 grommet to suit mains cord
3 small grommets
1 cable clamp
1 solder lug
4 rubber mounting feet
4 8mm brass standoffs
2 mica washers and one insulating bush for Triac
2 PC fuse-holder clips
1 5-ampere fuse type 3AG
1 plastic knob
nuts, bolts etc

SEMICONDUCTORS
1 x IN4004 400V PIV, 1A silicon diode
3 x IN5060, A14D, 400V PIV 2.5A controlled avalanche diodes
2 x IN4148 small signal diodes
1 x IN965 400mW 15V zener diode
1 x C106D SCR
1 x SC151D TRIAC
1 x 4001 quad two-input NOR gate

RESISTORS
(¼W unless specified otherwise)
1 x 1M, 2 x 18k/1W, 3 x 10k, 1 x 5k/10W, 2 x 2.2k/1W, 1 x 1k, 1 x 1k/1W, 1 x 100 ohm/2W, 1 x 2M linear pot.

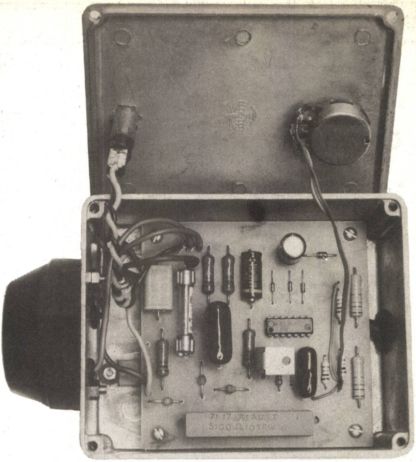
CAPACITORS
1 x 100uF/16VW electrolytic (PC-mounting)
1 x 1uF/350VW electrolytic (pigtail type)
1 x 0.47uF/100VW metallised polyester
1 x 0.47uF/400VW metallised polyester
1 x 0.082uF/250VAC polycarbonate

1.2kW in the form that we have built it. With a better heatsink for the Triac and a 10-amp fuse, the circuit could control loads up to 2.4kW.

Most of the components are mounted on a printed circuit board measuring 88 x 87mm and coded 80pc4. To avoid component overcrowding on the PCB, do not use components with ratings higher than specified in our parts list. Note that some holes on the PCB may require enlarging to take the pigtails of the SCR, and the fuseholder.

Mount the 10W resistor a couple of millimetres above the board to avoid charring the board, as it runs quite hot. If PCB fuse holders are difficult to obtain, the fuse can be soldered into the circuit with stiff tinned copper wire. Mount the resistors and capacitors first, then the diodes and SCR. Take care in handling the CMOS integrated circuit, and solder the power supply pins first (with the soldering iron barrel connected to the negative supply line on the PCB) to allow the internal static protection circuitry to take effect.

Clamp the power cord securely to the bottom of the box. The screws holding the cable clamp and the Triac should be kept as short as possible to prevent them shorting to the PCB and



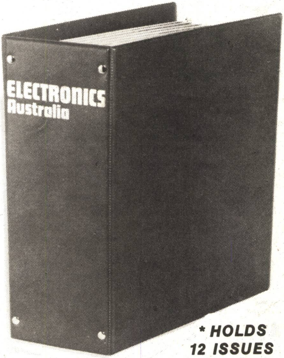
For safety's sake, a diecast box is recommended for this project.

DON'T LET YOUR VALUABLE ISSUES GO ASTRAY

ELECTRONICS AUSTRALIA BINDERS

These attractive binders finished in brown plastic with gold lettering will keep your back issues of Electronics Australia neat and tidy.

Available from
Electronics Australia,
57 Regent St, Sydney. PRICE: **$4.50**
or by mail order from Electronics Australia, P.O. Box 163, Beaconsfield 2014.
PRICE **$5.50** NSW; **$6.50** other states.



* HOLDS 12 ISSUES

*Magazines prior to April 1971 will need to be trimmed to fit binder.

the neon, respectively. It is important to use grommets for the mains cord and the wires passing through the case from the externally mounted mains socket. The neon bezel should be mounted on the lid of the box, clear of the Triac end of the printed circuit board.

The earth lug should be secured to the case with a nut, bolt and lock washer. The green or green/yellow wire from the mains cord and the wire from the earth pin of the mains socket must be connected to the earth lug and be securely soldered at this point.

MOST IMPORTANT

The most important aspect of the construction procedure is mounting the Triac. The heat sink tab of the Triac is at mains potential, and must be insulated from the box. Fig. 3 shows the correct method of mounting the Triac. We used two mica washers with heat sinking compound on each surface. The hole for the mounting screw must be deburred to keep the heatsink surface flat and to prevent possible "punch-through". Check the insulation with a meter. Attempting to operate the controller with faulty insulation will blow the fuse.

When construction is complete, check the PCB board for component orientation and check the wiring for errors and shorts to the case. A meter is helpful here. With a fuse in place, the Heat Controller is ready to be used. Switching on the power should cause the neon to flash on and off, and adjusting the potentiometer should vary the ratio of on-time to off-time. Connecting a resistive load to the controller will allow heat control which is directly proportional to the duty cycle of the neon.

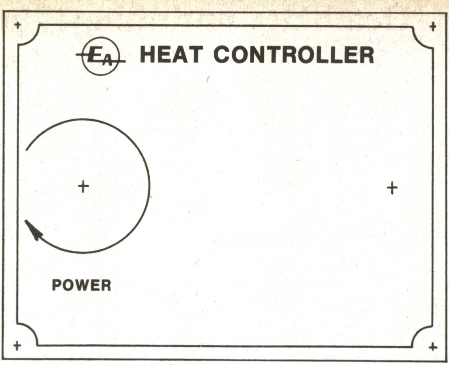
Overall the Heat Controller works very effectively. No radio interference could be detected from our prototype. When driving a radiator, the heater bar could be seen to glow more strongly in time with each pulse of power, but the heat level remained steady. At half power the radiator bar did not glow but emitted a steady warmth.

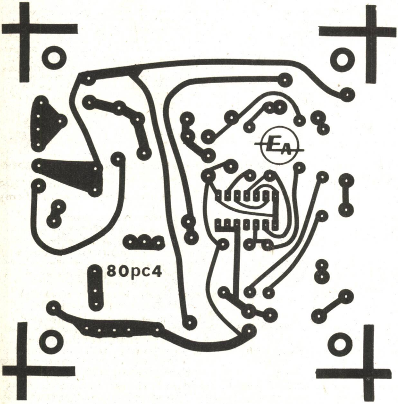
Remember that, as presented here, the Heat Controller is only suitable for loads up to 1.2kW. Bigger loads can be accommodated by mounting the Triac on a better heat sink.

We estimate that the current cost of parts for this project is approximately

$27

including sales tax.





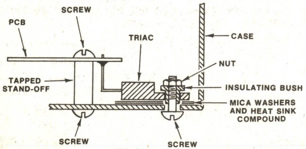
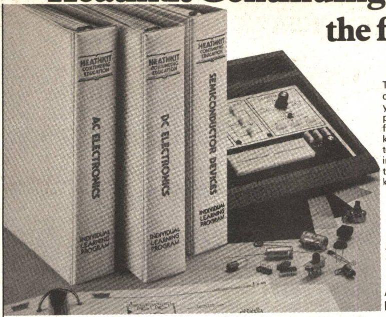


FIG. 3

Shown on this page is the artwork for the front panel and printed circuit board. Fig. 3, at left, shows the Triac mounting details.

Heathkit Continuing Education Series—
the fast, easy, low-cost way to learn electronics!


HEATHKIT CONTINUING EDUCATION
AC ELECTRONICS
INDIVIDUAL LEARNING PROGRAM
HEATHKIT CONTINUING EDUCATION
DC ELECTRONICS
INDIVIDUAL LEARNING PROGRAM
HEATHKIT CONTINUING EDUCATION
SEMICONDUCTOR DEVICES
INDIVIDUAL LEARNING PROGRAM

These four basic programmes provide an excellent overview of contemporary electronics—they'll provide you with the fundamentals you need to follow your interests wherever they may lead you. The programmed learning text is clearly written, with technical material fully explained as it is introduced. Built-in quizzes let you test your knowledge at each step. The records give you a "personal" outline of text material and additional information, and electronic parts are included for use in the experiments. Each course leads logically into the next, and when you complete all four, you'll have a thorough knowledge of basic electronics.

Part 1: DC Electronics— electrical fundamentals, theory and practice—

1. *Electron Theory*
2. *Voltage*
3. *Resistance*
4. *Ohm's Law*
5. *Magnetism*
6. *Electrical Measurements*
7. *Network Theorems*
8. *Inductance and Capacitance*

Includes all texts, records, 56 parts for 20 experiments. Average completion time, 20 hours.

Programme EE-3101 **$68.00**

Part 2: AC Electronics— sine waves, inductive and capacitive reactance, impedance, phase shift, transformers and filters

1. *AC Fundamentals*
2. *AC Measurements*
3. *Capacitive Circuits*
4. *Inductive Circuits*
5. *Transformers*
6. *Tuned Circuits*

Includes all texts, records, 16 parts for 8 experiments. Average completion time, 15 hours.

Programme EE-3102 **$68.00**

Part 3: Semiconductor Devices— transistors, zeners, SCR's, FET's, digital and linear IC's, LED's, opto-electronics

1. *Fundamentals*
2. *Diodes*
3. *Zener Diodes*
4. *Special Diodes*
5. *Bipolar Transistor Operation*
6. *Bipolar Characteristics*
7. *FET's*
8. *Thyristors*
9. *IC's*
10. *Opto-electronic Devices*

Includes all texts, records and 27 parts for 11 experiments. Average completion time, 30 hours.

Programme EE-3103 **$68.00**

Part 4: Electronic Circuits Learning Program

Brings the knowledge you've gained in the first three programs to bear on the latest circuits used in solid-state electronics. This program covers the operation of common solid-state electronic circuits. It shows you how to analyse and design simple amplifiers and oscillators. You learn about pulse circuits, multivibrators, SSB and how to use a voltmeter and oscilloscope to analyse the operation of electronic circuits. Included are texts, records, and 110 electronic components for 18 different experiments.

Programme EE-3104 **$83.00**

Heathkit Experimenter/Trainer

For the Heathkit DC, AC and Semiconductor programs—helps you perform each project quickly and easily. And after you finish the programs, it's ideal for "breadboarding" your own design projects. Has solderless breadboarding sockets, 2-range variable sine and square wave signal source, dual-variable power supplies for positive and negative voltages (both variable over 1.2 to 16 volts, 120 mA, both regulated and short-circuit protected). Built-in 1k and 100k linear potentiometers. Center tapped power transformer secondary provides 30 V rms, 50 Hz for line experiments.

Kit ET-3100 **$121.00**

Heathkit Digital Design Experimenter/ Trainer

Use it to perform all the experiments in the Heathkit Digital Techniques Programme, also to develop projects, build and test prototypes, verify circuit operation, check digital IC's. Has solderless breadboard sockets, four binary data switches, 2 "no-bounce" switches to pulse logic circuits, 3-frequency pulse clock generator, 4 LED's for visual indication of logic states. Three regulated power supplies: +12V, 100 mA current limited; −12 V, 100 mA current limited; +5 V, 500 mA, overload protected. Accommodates up to eight, 14 or 16-pin dual-in-line IC's, also 24, 28 and 40-pin DIP's.

Kit ET-3200 **$147.00**

HEATH
Schlumberger

Digital Techniques Program—For the advanced experimenter, technician, hobbyist or engineer.

Learn digital fundamentals, circuit design, TTL, ECL, CMOS, PMOS, NMOS integrated circuits; SSI, MSI and LSI; ROM's, PLA's; microprocessor theory

1. *Introduction: techniques and uses, binary numbers, digital codes.*
2. *Semiconductor Devices for Digital Circuits.*
3. *Digital Logic Circuits: AND gates, OR gates, NAND/NOR logic, etc.*
4. *Digital Integrated Circuits: TTL, ECL, CMOS, nMOS, pMOS, how to choose.*
5. *Boolean Algebra.*
6. *Flip-Flops and Registers: latches, D & JK flip-flops, storage registers, applications.*
7. *Sequential Logic Circuits: binary, BCD, modulo N, up/down counters, dividers, shift registers.*
8. *Combinational Logic Circuits: encoders, decoders, exclusive OR, comparators, multiplexers, ROM's, PLA's.*
9. *Digital Design: combinational and sequential circuits, procedures.*
10. *Digital Applications: counters, computers, microprocessors.*

Update your knowledge of electronics with this program in digital fundamentals. Provides a solid background with particular emphasis on circuit design. Covers the latest integrated circuits; ROM's and PLA's; even microprocessors. Helps you learn to design digital circuits for virtually any application.

The program assumes a prior knowledge of electronics fundamentals, either completion of the Heathkit basic electronics programs or equivalent knowledge. It can be successfully completed by technically-oriented people with a math or science background.

The program includes all texts, records and 44 parts for 24 experiments. Av. completion time: 40 hours.

Programme EE-3201 **$90.00**

ORDER BY COUPON NOW OR COME TO OUR SHOWROOM

Please rush me the programme of my choice. My cheque for $ is enclosed plus $7.00 for package & post.

Name ....

Address ....

....**P/Code**..................

Send to: W. F. Heathkit Centre,
220 Park St., South Melb. 3205. Phone: 699-4999

☐ *Programme EE-3101*
☐ *Programme EE-3102*
☐ *Programme EE-3103*
☐ *Programme EE-3104*
☐ *Kit ET-3100*
☐ *Kit ET-3200*
☐ *Programme EE-3201*

The Serviceman

On lightning, kookaburras, and Russian TV sets.

Some time back, in the June 1978 issue of these notes, I told the story of a colleague whose property had suffered a lightning strike; I mentioned various household appliances which were damaged. Now it has happened again, a little closer to home, and produced a fresh crop of funny (peculiar) effects.

The victim in this case was none other than a nearby amateur operator friend and, as might be imagined, some of his amateur equipment was affected. But this is not just another recital of damage which often follows a lightning strike; one result of the strike is a "first" to my knowledge, and of special interest to TV servicemen.

The story also has its humourous side, though it didn't seem funny at the time and it could have had very serious consequences.

It was one of those afternoon thunderstorms which frequently occur in the Sydney area during the summer months, following a hot, humid day. My friend and his wife had spent the day at the beach but, seeing the storm approaching in the early afternoon, had packed up and headed for home.

They reached home just before the storm broke and my friend hurried out again to do some urgent shopping. His wife was left to attend to a family of kookaburras, sitting on various antennas about the place and demanding to be fed. Countless generations of kookaburras have been fed by my friend for more years than he cares to remember, and their antics and personalities would make a full length story in itself.

As my friend remarked, "I'm not really sure whether we have a family of tame kookaburras, or whether the kookaburras have a family of tame humans."

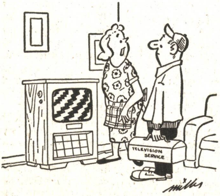
Which explains why his "XYL" was to be found, still in her swimsuit and bare feet, standing on the back patio, clutching a handful of chopped up meat, in what was, at that time, a sharp shower of rain. She was also standing almost directly beneath an 80-metre dipole, strung from corner to corner of the block between two convenient trees.

This was the site of the primary strike, though it appears that there were several secondary strikes. My friend's wife had no idea what was hit, being aware only of a blinding flash and a — literally — deafening crack. The kookas took off with angry screeches, not to be seen again for another 24 hours.

Meanwhile, my friend's wife hurried inside, expecting to find a fire somewhere, and ready to call the local brigade. There was no fire, and just as well: the phone was quite dead!

Otherwise, as far as she could determine, there was no obvious damage to any of the household appliances. But when my friend returned and took stock, the list of casualties began to grow. The 80-metre dipole was the most obvious one. It had been hit a few feet from the central insulator, and the wire severed. The plastic insulator had vanished.

The feeder had also been severed at the insulator, and the insulation damaged for most of its length. The feeder was not connected to anything inside the shack, but had been lying against a metal speaker box for the six-metre equipment. Sitting on top of this was another speaker connected to a short-wave receiver.



"And it still looks like that when I switch it on". (Radio-Electronics)

Ignoring the first speaker, the lightning bolt had jumped from the frame of the short-wave speaker to the voice coil, one side of which was earthed, completely wrecking the speaker in the process. Rather strangely, perhaps, it did no other damage in that area.

But it did hit the six-metre equipment via another path. The equipment is an old AWA MR10 Carphone, converted for mains operation. My friend has also added an extension control unit, in the house, so that it can be operated from either the house or the shack. The cable for this runs in an un-earthed length of metal conduit between the two buildings.

Apparently the lightning struck the conduit, raised it to the voltage level of the lightning, which then broke down the insulation in the cable. Two of the 12 control wires were severed, one being a relay control line. This, in turn, took out a power diode in the relay power supply and, by some strange quirk, the coil of a relay in no way associated with that circuit, and not even connected at the time.

All of which was rather annoying, but at least the faults were fairly easily repaired. The real blow was to his modern two-metre transceiver which, unfortunately, had been left connected to the aerial. Its receiver still functioned normally but the transmitter had dropped its output from 10 watts to about one and a half watts.

The full story is not known at the time of writing, though the output transistor is naturally the prime suspect. This may well make story in itself at a later date.

So far all the faults, if not completely explainable, were at least in keeping with the usual run of lightning strike experiences. (The telephone cable had been severed where it emerged from the ground underneath the house!) But two unusual ones were yet to come.

When my friend switched on his TV set that night he was shocked to realise that the screen was displaying two patches of gross impurity, the larger one occupying most of the top left corner of the screen, and causing flesh tones to take on a distinct purple hue. The smaller one was in the lower right corner.

It wasn't a serious problem, and responded immediately to a degaussing coil which I loaned him. But how did it happen? Did the lightning strike create such a powerful magnetic field that it magnetised the shadow mask?

It seems the only explanation, though I must confess that it is the first time I have heard of such a thing. At the same time, it might explain some of the mysterious cases of impurity which we all encounter from time to time, and for which there seems to be no ready explanation. (Many owners may not become aware of such a fault immediately, and the trail is cold by the time the serviceman has called).

And the final casualty was just as mysterious. My friend has fitted his house with a burglar alarm, using reed switches buried in the door and window frames, and operated by permanent magnets. The next time he went to set the alarm he realised that it was setting even though several windows were still open.

Closer investigation revealed that every reed switch which had been closed (ie, window or door closed) when the lightning struck had remained closed. Nor can we be sure of the exact cause. One theory is that the heavy magnetic field which effected the picture tube also magnetised the reed switches. Another is that there was a current flow through the reeds which welded them together.

In favour of the magnetic theory is the fact that the reed switches used were a very early variety which had a tendency to this problem if used with large magnets. In fact, some were rejected by my friend during installation

Also, my friend was able to un-stick at least one of the reeds by using the same de-gaussing coil that I loaned him for the picture tube. In other cases, it was not physically possible to provide an intimate coupling between the coil and the reeds.

Against the current flow theory is the fact that the series circuit, comprising all the reeds, was not complete at the time of the strike; several windows and doors were open. Had there been a current flow it would have had to involve an insulation breakdown, yet none has been found.

But to confuse the issue still further, my friend found that the most effective way to un-stick the reeds was to gently tap the woodwork over the reeds with a hammer. Once un-stuck, they behaved normally when reset and released again. And a couple of them un-stuck spontaneously after a few hours.

But, whatever the mechanisms involved, the effect on both the picture tube and the reed switches is something I have not heard of before and, as such, both are worth keeping in mind. The experience may well help solve a problem in the future.

As for the rest of the story, it simply serves to emphasise once again the power and unpredictability of lightning strikes. As I said earlier, it has its humourous side now, but my friend's wife was not laughing at the time; a strike that close is too close for comfort.

Have circuit, will dabble!

By contrast, my next story is about as far removed from thunderstorms and kookaburras as it can be — it is a story of how a Russian TV set was converted for Australian standards.

The story comes from Mr J. E., of Bull Creek, Western Australia, and is best told in his own words.

A friend asked me if I could modify a Russian monochrome solid-state TV receiver for use locally. My first reply was "No hope" but, when he told me that it had been used in the UK and that he had the circuit diagram, I changed my mind.

The set had a 16cm screen and appeared to be designed primarily for 12V DC operation, but a piggy-back mains supply was attached to the rear by a pair of knurled screws.

The circuit information was better than I had hoped for, and included a coloured layout of the printed boards. Naturally the explanatory notes were in Russian, but the symbols and letters resembled western practice. It did not take long to work out that 1,7B meant 1.7V.

The set had 12 VHF channels, with provision to fit a UHF tuner if required. In general appearance it would not have looked out of place in one of our shops, had it not been for the labels on the controls. (Mr J. E. sets out some of the Russian captions, with their translations, but it is doubtful whether our typesetters could cope with the Russian alphabet. Ed).

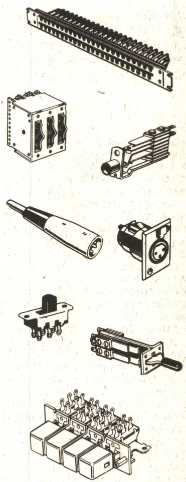
As is too often the case, the owner was rather vague about its history and stated simply that he could obtain some sound, but no picture. When switched on and connected to an external antenna it seemed to be seriously lacking in sensitivity. Eventually I located a weak picture on the set's channel seven, but it showed no inclination to lock, either vertically or horizontally.

From force of habit I looked at the back for the vertical and horizontal hold controls and found two likely knobs, labelled in Russian, which proved to be the ones required. By

SWITCHCRAFT®

CONNECTORS & ELECTRONIC COMPONENTS

Superb quality and reliability from one of the oldest and most experienced manufacturers in the U.S.A.



AUSTRALIAN DISTRIBUTORS
AUDIO TELEX COMMUNICATIONS PTY. LTD.

SYDNEY
1 Little Street,
Parramatta, 2150
Tel: 633 4344

MELBOURNE
7 Essex Road,
Mt. Waverley, 3149
Tel: 277 5311

BRISBANE
394 Montague Road,
West End, 4101
Tel: 44 6328

much patient adjustment a stationary picture was obtained momentarily and, while it looked vaguely familiar, there was also something odd about it. Then the penny dropped — it was a negative picture!

This could explain why the picture refused to lock, but I was puzzled as to how this situation had occurred. From memory, early British TV used positive modulation; white was peak modulation and the sync tips minimum. But I felt sure that, with the change to 625 lines, this had been reversed, with the sync pulse at peak modulation, as in Australia.

Inspection of the circuit showed that the picture should have been of correct polarity. The video detector was facing the correct way to give a negative sync output, the signal going from there to an emitter follower, which delivered the same phase to the video output transistor.

Output from this transistor would have positive sync polarity which, when fed to the cathode of the picture tube, would make peak modulation (the sync pulses) black, which was as it should be. But inspection with a CRO at the detector output confirmed that the reverse was the case. How could this be?

The diode was in a shielded can but a check with an ohmmeter confirmed that it was probably the wrong way round. Replacing it with another diode, connected as in the circuit, produced a good positive picture which locked quite readily.

Why the negative picture was so weak is not known for certain, but it seems likely that the reversed diode may have upset the bias on the emitter follower, and subsequent stages. On the other hand, it may have had something to do with the fact that I had simultaneously resoldered some of the doubtful looking joints elsewhere on the board.

The next problem was to find out why there was no sound, other than noise. A quick look at an English TV test confirmed that their sound and vision carriers are separated by 6MHz, rather than the 5.5MHz used in Australia. Thus is would be necessary to re-align the sound IF.

Unfortunately, there was not nearly enough adjustment in the coil slugs, and it was necessary to either replace capacitors, or add capacitors to existing ones. The job was tackled stage by stage, as for an AM radio receiver, using a generator and a DMM with an RF detector probe.

The sound was derived from a secondary winding coupled to a series sound trap circuit between the emitter follower and the video output stage. The capacitance in the sound trap circuit was increased from 510pF to 680pF. Rather surprisingly, the capacitance across the IF transformer had to be increased by 50%, from 120pF to 180pF.

Adjusting the secondary of the ratio detector posed a minor problem until it was remembered that it would act in the same way as a tuned circuit coupled to a dip oscillator and absorb maximum power from the primary, when resonant. Accordingly the secondary was adjusted for minimum voltage across the primary of the ratio detector, with the final adjustment made in the usual way.

Much joy was experienced when both picture and sound appeared on the one channel available. Checking the local channel frequencies revealed that, by a happy coincidence, channels two and seven in the set could be aligned for the same local channel numbers.

Channel nine seemed to be in between channels eight and nine in the set, but there was sufficient adjustment to allow either to be used, with some resetting of the fine tuning.

That is the main part of Mr J. E.'s story. He goes on to tell how he fitted a heavier three-core cable in place of a rather lightly insulated two-core cable, and to comment about the quality of the set. In general, the latter is mainly favourable, but he did remark adversely on the quality of some of the soldered joints. Even so, the Russians aren't alone in this respect.

REVERSED DIODE?

The reason for the reversed diode remains something of a mystery, but I suspect that the set had been modified, by someone in Russia — probably on request — to suit the British system, on the simple basis that the British system used positive modulation on VHF. It is most likely, however that it was never used in Britain or that, if it was, it was found not to work. (There were many more differences than the modulation polarity).

Further confusion arises from the fact that the set was obviously designed for a 6MHz video/sound carrier separation, which is valid for the modern British UHF system. Somewhere, it seems, somebody became hopelessly confused.

Mr J. E. concludes: When the market value of the set is considered it is doubtful whether it was really worth it, but it did make a change from routine jobs.

I agree, J. E., and I think most of us enjoy a challenge of this kind from time to time, while there is more than a little satisfaction in salvaging something that would otherwise finish up on the tip.

VIDEO TECHNICS
THE CAROUSEL CENTER, SHOP 17 & 18, 530 OXFORD ST., BONDI JUNCTION.
P.O. BOX 50, BONDI ROAD, BONDI 2026, NSW 2022. TEL.: 387 2555.
3RD FLOOR, EQUITABLE LIFE BUILDING, 301 CORONATION DRIVE, BRISBANE 4064. PH. 36 1257

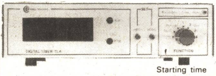
COLOUR TV MONITOR KIT
CONVERT YOUR COLOUR TV EASILY WITH THIS CONVERSION KIT AND SAVE MONEY. SPECIALLY DESIGNED.

VIDEO MOVIES
FULL LENGTH FEATURES — MANY TITLES AVAILABLE AUSTRALIA WIDE

3 HOURS VCR VIEWING
3 hours continuous recording/playback. 1-2-3 operation simplicity. Video head and azimuth recording system: key to perfect picture reproduction. The ingenious yet simple "M" loading system, low 35 watts power consumption.
Units available — Sony, Philips, National etc.

SPECIAL
UNIVERSAL TV VIDEO MONITOR
IDEAL AS DISPLAY UNIT FOR DREAM 6800, SORCERER, TRS-80, APPLE, CCTV, OR ANY COMPOSITE VIDEO SIGNAL. FEATURES: 240V AC OR 12V DC, VIDEO INPUT VIA QUALITY BNC SOCKET, CAN BE SWITCHED OVER AS TV RECEIVER $149.00

VIDEO EQUIPMENT —
Sony, Akai and JVC Colour and BW Portopacks. We have several BW Portopacks traded on colour sets. Also agents for JVC, National, Sony and Nec Umatic equipment. All formats and brands colour and BW recorders, editors, generators and blank video tapes available. New and used equipment. Trade and terms. Super 8 to Video Tape.
Colour receiver monitor conversion kit specially designed to suit variety of receivers, $95.

SPECIAL CLOCK TIMERS
Can be set to switch equipment up to 4 days ahead.

Starting time accurate to a second
$195 + P.P.

FRANCHISEES REQUIRED FOR S.A., W.A., VICTORIA AND TASMANIA

SAVER — WE ARE GIVING A BETTER DEAL ELECTRONICS IS DAVID REID MAKE

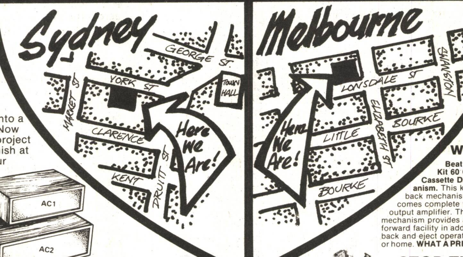
IF IT'S ELECTRONICS WE'VE GOT IT!!

NOW 2 GREAT LOCATIONS

OPENING SPECIALS

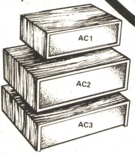
Available both Branches

THE HEART OF ELECTRONICS IN AUSTRALIA



HEY

Turn these boxes into a modern amplifier. Now you can give your project the professional finish at a price that fits your budget.



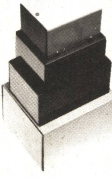
AC1:
Length 300mm
Width 195mm
Depth 92mm
ONLY $13.75

AC2
Length 360mm
Width 282mm
Depth 110mm
ONLY $19.75

AC3
Length 380mm
Width 295mm
Depth 110mm
ONLY $18.50

NOW

Give your project the finish it deserves. Davred metal boxes are the little two-tone brown boxes which have proven very popular for many different kits and projects. No. 4 comes complete with 4 x MM51 rubber feet.



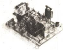
	Length	Width	Depth	
No. 1	**82mm**	**70mm**	**50mm**	**$2.95**
No. 2	100mm	82mm	54mm	**$3.45**
No. 3	127mm	89mm	54mm	**$3.95**
No. 4	140mm	120mm	90mm	**$4.75**
No. 5	125mm	165mm	120mm	**$6.25**

GET IT TOGETHER

with an electrokit

Beat this value! Kit 60 Compact Cassette Deck Mechanism. This kit is a playback mechanism that comes complete with stereo output amplifier. The mechanism provides a fast forward facility in addition to normal playback and eject operation. Ideal for the car or home. **WHAT A PRICE: Normally $52.50.**

This Month $42.50



STOP THIEF!

This kit is designed to be flexible and a completely adaptable alarm circuit for general use in such situations as the home, car, boat or any other security application. Runs on a 12 volt DC supply battery. **ONLY $13.50**

TURN IT UP! Complete 8 + 8 Watt Stereo Amplifier

When assembled this kit is a complete high quality stereo amplifier with 2 channel record reproduction from ceramic or medium output cartridges. **LOOK! $48.00**

KIT 51 10 Watt Sanken Power Module & Component Module

This kit includes a 10-watt Sanken hybrid amplifier S1 10 10G and its ancillary components. **ONLY: $14.50**

FREE * FREE MELBOURNE OPENING GIVEAWAYS

To every customer who calls into our Melbourne Electronics Centre in May we will be giving a free record cleaning cloth.

WOW LOOK AT THIS

OUR MELBOURNE ELECTRONICS CENTRE NOW STOCKS THE NUMBER ONE METAL DETECTOR — BOUNTY HUNTER. CALL INTO EITHER SYDNEY OR MELBOURNE FOR A LOOK AT OUR SUPER RANGE OR TELEPHONE OR WRITE FOR OUR FREE BOUNTY HUNTER BROCHURE.

BOUNTY HUNTER®

DAVID REID ELECTRONICS PTY. LTD.

127 York St., P.O. Box Q103
Sydney 2000. Telephone 296-601.

or

356 Lonsdale St., Melbourne 3000.

bankcard

WE TAKE BANKCARD

MAIL ORDER INSTRUCTIONS

MINIMUM POST/PACK CHARGE $1.00

Order Value	
$5-$9.99	$1.00
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$4.00
$100 or more	$5.00

Prices subject to alter. E&OD

YOU SEE US FIRST — WE HAVE ELECTRONICS FOR YOU — WE ARE THE HEART OF ELECTRONICS IN AUSTRALIA —

MAKE SURE YOU SEE US FIRST — WE ARE THE HEART OF ELECTRONICS IN AUSTRALIA — THE GREAT ELECTRONICS

EAT ELECTRONICS SAVER — WE ARE GIVING A BETTER DEAL — WE ARE ELECTRONICS

An In-Circuit Component Tester

Build this useful accessory for your CRO

When servicing faulty equipment involving printed circuit boards, have you ever wished that you could make specific tests on certain components without removing them from the board. Here is a little device which will go at least some of the way towards this ideal. It can be made up for a few dollars and in a very short time.

by IAN POGSON

This interesting little device had its origin in the US Navy and was later published in "QST". We thought it was interesting enough to make up and present it to readers. Apart from its uses in being able to check components while they are still in circuit, it can be a good exercise in some theory.

The idea of having a piece of test equipment which can check the quality of components still in circuit is an attractive one. If this can be done, much time can be saved removing suspect components for testing. This very simple device can test resistors, capacitors, inductors, diodes, transistors etc while still in circuit.

Basically, it consists of a step down transformer, giving just a few volts from the 240V mains. This low voltage is further divided down to about one volt by means of a resistive voltage divider and applied to the vertical and horizontal amplifiers of a CRO. Two test probes are provided to apply this low voltage through a 1k resistor which limits the current through any component to a maximum of 1mA.

With such a low voltage and with the limited current, the chance of damaging any components is virtually eliminated.

If it seems that we have arrived at the ultimate in test equipment of this kind, let me hasten to point out that this is not so. The tests which are possible will indicate whether a component is good or bad in rather broad terms.

Another point which cannot be overlooked is that a CRO is a necessary part of the test setup. Fortunately however, many readers have access to a suitable CRO.

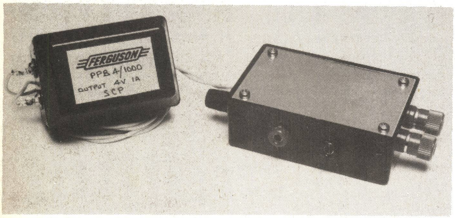
Before proceeding to show how this device can be used in practice, perhaps a look at the theory of operation may be of interest.

From the circuit, we can see that the low AC voltage appearing across the 100 ohm resistor is connected to the vertical and horizontal amplifiers of the CRO. With one end of the 1k resistor at earth or reference potential and with the probes open circuit, the input to the vertical amplifier is at earth potential and the voltage at the other end of the 100 ohm resistor is fed to the horizontal amplifier to produce a horizontal trace on the CRO screen.

When we short-circuit the two probes, the horizontal amplifier input will be shorted to earth but the other end of the 100 ohm resistor connected to the vertical input is now shunted by the 1k resistor to produce a vertical trace on the CRO screen.

Other than the open-circuit and short-circuit condition just outlined, any other measurements will fall somewhere between these two extremes. A resistor will give a trace somewhere between horizontal and vertical, depending on its value.

Reactive components such as capacitors and inductors, produce a phase shift between the horizontal and vertical components, giving an elliptical trace on the screen, with the shape and orientation depending on the amount of reactance of the particular component. Small values of capacitance give an ellipse with a horizontal major axis, whereas a small value of inductance gives an ellipse with a vertical major axis.

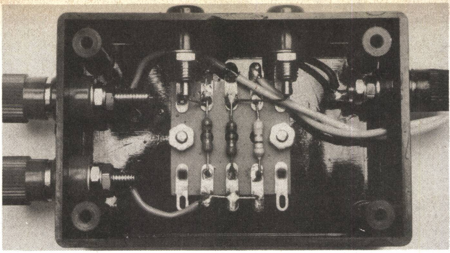


Power for the In-Circuit Component Tester is derived from a 4V AC plugpack supply. The device can test resistors, capacitors, inductors, diodes and transistors.

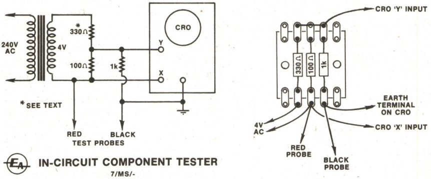
We estimate that the current cost of parts for this project is approximately

$11.00

This includes sales tax.



The prototype was built on tagstrip and housed in a plastic utility case.



The circuit (left) consists of just three resistors and a transformer power supply. The wiring diagram at right should make construction easy.

The above cases are the simple and straightforward ones. However, the number of possibilities when two or more components are combined is almost unlimited. A number of actual CRO patterns is shown here, including an example or two of more complex networks.

Construction of the tester is very simple. We mounted the three resistors on a piece of tagboard and mounted it in a plastic utility box. The various terminations are provided on three sides of the box. At one end are the terminals for the leads to the "X" and "Y" CRO amplifiers. At the other end is a terminal for the "earth" or reference line for the CRO, together with a grommet passing a twisted pair for the AC input from the transformer. On the side are a red and a black banana socket for the two test probes.

The transformer we used is a new plugpack type just released by Ferguson Transformers Pty Ltd with an output of 4VAC. The twisted pair of leads from the tester are terminated on the two screw terminals provided on the transformer. Incidentally, if you use a transformer with a different secondary voltage, then the 330-ohm resistor will have to be changed to maintain the nominal 1VAC across the 100 ohm resistor.

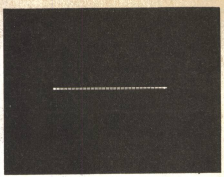
PARTS LIST

1 plastic utility box 83mm x 54mm x 28mm
3 terminals, 2-red, 1-black
2 banana sockets, 1-red, 1-black
1 rubber grommet
1 tagstrip with 5 pairs of tags
1 100-ohm ½W resistor
1 330-ohm ½W resistor (see text)
1 1k ½W resistor

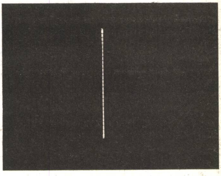
1 Ferguson plugpack transformer, PPB4/1000, or similar (see text)

Sundries: Solder, solder lugs, hookup wire, screws and nuts.

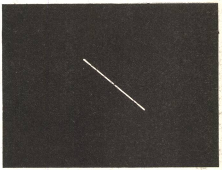
Having completed the tester, it has to be set up before it can be used. To do this, the transformer is plugged into a power point and the earth lead and the "X" and "Y" leads are connected to a CRO. A pair of test prods are plugged into the banana sockets. With the transformer and CRO switched on, we are ready to make tests. To give some idea of what to expect on the CRO screen, we have reproduced some pictures which we took from our CRO screen, with various items across the test probes.



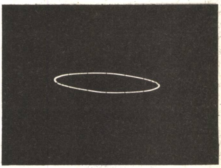
Open circuit.



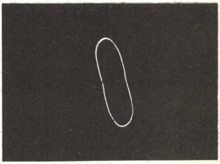
Short circuit, or continuity.



1.2k resistor.



Transformer primary inductance.



Inductance with resistance.

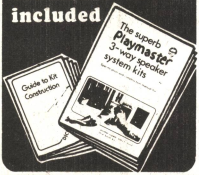
All CRO settings 0.5V/cm horiz. & vert.

What's so hard about a DICK SMITH Kit?

Just choose a kit. .

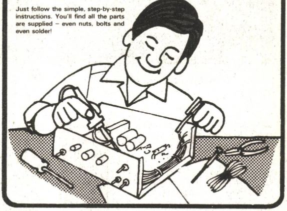
Everything from audio amplifiers to car ignitions with degree of difficulty for your guidance.

Full instructions PLUS guide to kit construction included


The superb Playmaster 3-way speaker system kits
Guide to Kit Construction

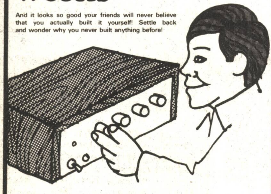
all parts supplied

Just follow the simple, step-by-step instructions. You'll find all the parts are supplied – even nuts, bolts and even solder!



It's finished & it works

And it looks so good your friends will never believe that you actually built it yourself! Settle back and wonder why you never built anything before!



GUARANTEE

All Dick Smith kits are made from brand new and guaranteed components. Each kit is made up in consultation with the major electronics magazines, and includes latest amendments.

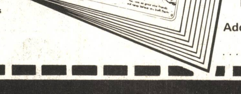
If by chance you cannot get your kit to work, many of the major kits include a 'sorry Dick, it doesn't work' coupon which allows you to have the kit serviced in our laboratories for a token fee.

The first step?

send for our

FREE

Colour Kit Catalogue



Our colour kit catalogue contains detailed illustrations of most of our kits - and it's yours free for the asking.

16 pages of kits for all tastes and budgets. Send for your free copy today!

(also available to personal callers at any of our stores and many re–sellers).

MAIL ORDER CENTRE

P.O. Box 321, North Ryde, NSW
2113, Australia.

Dick, send me my FREE Colour Kit Catalogue.

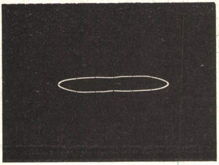
Name ....

Address ....

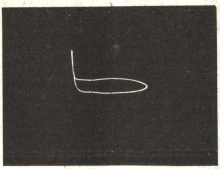
.... Postcode ....

DICK SMITH ELECTRONICS

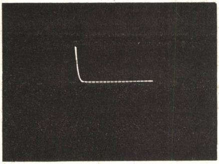
SEE OUR OTHER ADVERTS IN THIS MAGAZINE FOR OUR STORE ADDRESSES AND RESELLERS



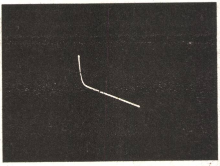
0.47uF capacitor. A larger value, say 10uF or more, would give a vertical ellipse.



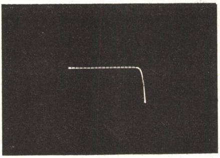
Silicon diode and parallel 0.47uF capacitor.



Forward-biased silicon diode.



Silicon diode with parallel resistor.



Reverse-biased silicon diode.

It should be pointed out that the type of CRO available will have some effect on the actual pattern which appears for any given situation. The CRO which we used was a modern one and ideal for this applicaton. It has two identical amplifiers, with no evidence of relative phase shift between them. On the other hand, if the CRO to be used does not have identical amplifiers, then the possibility of a difference in phase shift is likely. Under resistive conditions, it will look as though there is some reactance in the circuit, as with some capacitance or inductance.

If the CRO to be used only has a vertical amplifier, with direct access into the deflection plates for the horizontal component, then the likelihood of phase shift differences showing up is even higher. Also, with no gain available for the horizontal component, the pattern on the screen will possibly be quite small. EA

PLESSEY
COMPONENTS

NOVOL

NON-VOLATILE LOGIC

MN9102

NON-VOLATILE QUAD LATCH

FEATURES

- ☐ Data Retention for One Year in the Absence of Applied Power
- ☐ Simple to Use
- ☐ Standard Power Supplies Only (+5V, -12V)
- ☐ CMOS/TTL Compatible
- ☐ 14-lead DIL Package
- ☐ Typically Ten Million SAVE Operations

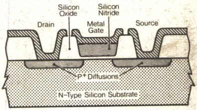
APPLICATIONS

- ☐ Metering Systems
- ☐ Elapsed Time Indicators
- ☐ Security Code Storage
- ☐ Last Channel Memory for Digital Tuning

MN9102

The MN9102 is a non-volatile 4-bit data latch which uses MNOS* transistors as memory.

**NOVOL devices are produced using the Plessey Metal-Nitride-Oxide-Silicon (MNOS) process. MNOS transistors, as shown here in simplified form, are fabricated with a "sandwich" structure gate dielectric consisting of a very thin layer of silicon oxide and a thicker layer of silicon nitride. In operation, a positive or negative charge injected (Written) into the nitride/oxide interface modifies the threshold voltage of the transistor. Since the injected charge is trapped within the bulk of the dielectric it is not affected by surface leakage and the difference between high and low thresholds can be detected (Read) over very long periods.*

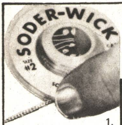


PLESSEY
COMPONENTS

PO Box 2 Villawood, NSW 2163.
Telephone 72-0133
Adelaide 269 2544 ● Melbourne 329 0044
Brisbane 36 1277 ● Perth 458 7111

One-Second Desoldering

with SODER-WICK



1. Hold Soder-Wick on termination with hot soldering tip. Wicking action soaks up solder.
2. Remove tip and braid. Termination is left clean and free of solder.

Soder-Wick is a specially treated copper braid which soaks up molten solder like a sponge. Desolders a P.C. pad in a second or so: acts as a heat sink to protect circuits and components.

From your Components supplier or ring:

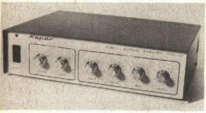
Royston Electronics

(02) 709 5293 (07) 44 0131
(03) 543 5122 (08) 42 6655
(002) 34 2233 (09) 381 5500

SW-2

Rapar

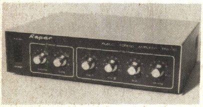
PUBLIC ADDRESS AMPLIFIERS YOU CAN DEPEND ON



TPA 50

Specs.
RMS power, 25 watts. Frequency response: 50Hz to 15kHz (+3dB at 8 ohms). Multiple outputs: 4, 8 and 16 ohms. 70 and 100 volt lines. Inputs: Mic. 1, 47k ohms, Mic. 2, 600 ohms. Aux. 300mV, Phono 2.5mV.
Size: 310mm (width), 230mm (depth), 80mm (height). Weight 3.8 kilos. Finish: Durable two-tone baked enamel.

***$146.97**



MODEL TPA 70

Specs.
RMS power, 50 watts. Frequency response: 50Hz to 15kHz (+3dB at 8 ohms). Multiple outputs: 4, 8, 16 ohms, 70 and 100 volt lines. Inputs: Mic. 1, 47k ohms, Mic. 2, 600 ohms, Aux. 300mV, Phono 2.5mV.
Size: 310mm (width), 230mm (depth), 80mm (height). Weight: 4.3 kilos. Finish: Durable two-tone baked enamel.

$183.60

TRADE AND DISTRIBUTOR ENQUIRIES WELCOME

MANUFACTURED BY:

RADIO PARTS GROUP

562 SPENCER STREET,
WEST MELBOURNE, VIC. 3003.
TEL. (03) 329-7888.

1103 DANDENONG ROAD,
EAST MALVERN, VIC. 3145.
TEL. (03) 211-8122.

DAVE RYALL ELECTRONICS

(Formerly KITSETS)

**T.T.L. BARGAINS
ALL LESS 20%**

7410	37c	30c
7413	83c	66c
7430	39c	32c
7440	39c	32c
7441	$1.58	$1.26
7442	$1.00	80c
7446	$1.40	$1.12
7460	39c	32c
7470	78c	62c
7480	$1.38	$1.10
7482	$1.88	$1.50
7483	$1.88	$1.50
7491	85c	68c
74121	75c	60c

ONE MONTH ONLY

Stock up on capacitors with this free offer. On producing this ad, for every 2 capacitors that you buy, we'll give you one of the same value absolutely free. This month only.

We have a full range of Plessey Foster speaker components; Philips speaker kits; Etone loudspeakers; Zippy boxes; Adcola soldering irons; Audio Leads & Accessories. Many many more items not listed here. Give us a ring at either store.

2 STORES

**293 St. Paul's Terrace,
Fortitude Valley,
Brisbane 52 8391.**

Plenty of parking in street opposite.

**657 Pittwater Road,
Dee Why.
Sydney 982 7500**

Mail Orders, P.O. Box 176, Dee Why 2099. Plus 1.00 p+p.

Australian Film and Television School

Sound Workshop

We're looking for creative, socially and culturally aware men and women, permanently resident in Australia, for the

**Three year fulltime training course
commencing in
March 1981**

We're a Commonwealth government authority, located in Sydney.

The course covers all aspects of the recording, balancing and mixing of dialogue, music and sound effects for films and television programs.

Training is also given in **production, editing,** and **camera** techniques. **Direction** is an option after satisfactory completion of the first year of the course.

Applications must be on the official form, available now (with information brochure) by phoning or writing to:

**Recruitment Officer
Australian Film and Television School
PO Box 126
NORTH RYDE NSW 2113
(02) 887-1666**

**Melbourne Representative
Australian Film and Television School
PO Box 373
NORTH MELBOURNE VIC 3051
(03) 328-2683**

Completed applications will be accepted from **Monday 26 May** and applications will close at **12.00 noon on Wednesday 2 July.**

Another look at this simple circuit

Courtesy light delay system for cars

Our delay system for car courtesy lights published in the January issue has aroused a lot of interest. This month we give details of modifications of the circuit so that this useful system can be fitted to other makes of cars, with different arrangements of lighting and wiring.

by PETER VERNON and GERALD COHN

A number of readers have written to us asking for modifications of the car courtesy light delay system to enable it to be fitted to this or that make of car. In view of this we decided to publish three versions of the original design which are suitable for a wide range of makes and models, including positive chassis vehicles.

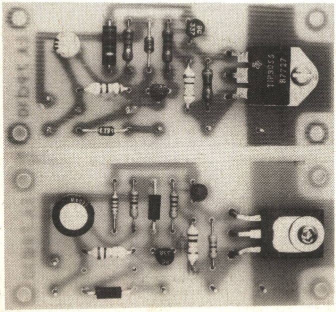
As designed the circuit is actuated by opening the car door, and holds the courtesy lights on for a pre-determined time after the car door is closed. Provision is made for the courtesy lights to be switched off automatically whenever the headlights or parking lights are turned on.

As published, the original circuit is suitable only for cars where both the headlights and the door switches are connected directly to the negative side of the battery via the chassis. On the other hand, many Japanese vehicles use a relay on the negative side of the headlights, while the lights themselves are connected directly to the positive side of the battery.

Again, some vehicles use the same headlight switching arrangement, but the car door switches are connected between the courtesy light and the positive side of the battery.

Other cars use relay-switched headlights and door switches on the positive side of the courtesy lights but the relay connection is between the headlights and the positive side of the battery, rather than to the chassis. In each case the original circuit will not work.

However, these problems are quite easily overcome by modifying the original circuit to suit the particular wiring system of your car. The three versions described are all built on the original printed circuit board, with only slight differences in the layout of the components.



Two versions of the courtesy light delay circuit are shown at left: at top, for negative chassis vehicles; below, for positive chassis vehicles.

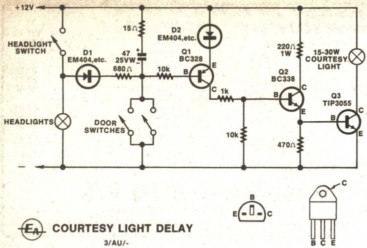
As described in the January issue, the basic circuit of Fig. 1 is quite simple. When one or other of the door switches is closed, Q1 is forward biased and conducts, turning on Q2 and Q3 and switching on the courtesy light. At the same time the 47uF capacitor is charged through the 15 ohm resistor. When the door switch is opened (by closing the car door) the charge on the capacitor maintains the bias on Q1. When the capacitor discharges the forward bias on Q1 is removed, Q2 and Q3 are turned off, and the courtesy light goes out.

In the original circuit, a diode is connected between the negative side of the capacitor and the headlight switch to prevent the capacitor charging through the headlight circuit as long as the headlight switch is open. Closing the headlight switch forward biases the diode and discharges the capacitor, so that switching on the headlights overrides the delayed turn-off of the courtesy lights. A resistor is included in series with D1 to limit the current through the diode to a safe value.

In cars which have the headlights connected to the positive side of the battery this diode override arrangement will not work because the diode will prevent the capacitor from being charged. This is corrected by connecting the diode from the headlight switch to the base of Q2. Fig. 2 shows the modified circuit.

Operation of the headlight switch now forward biases the diode, removing the bias from Q2 and causing it to turn off, turning off Q3 so that the courtesy light goes out. (Note that the 47uF capacitor remains charged, discharging slowly through the 10k resistor and the base/emitter junction of transistor Q1. If the headlights are turned off again before the capacitor has discharged, the courtesy light will come on again for a brief period.)

The third version of the circuit is intended for use in cars which have door switches on the positive side of the courtesy light while the headlight switch is connected to the negative side of the battery. This circuit, shown in Fig. 3, works in exactly the same way as the original design but is reversed in



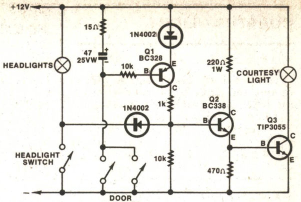


FIG. 2

Fig. 1, top left, is the original circuit while the three other diagrams are variations on the same theme.

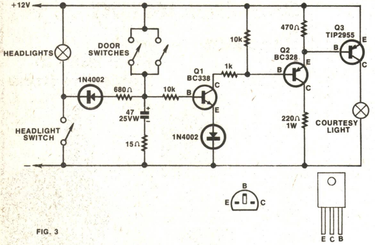


FIG. 3

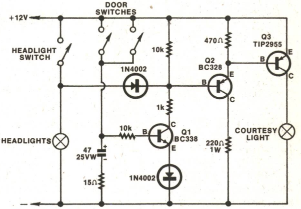
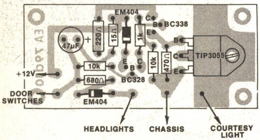
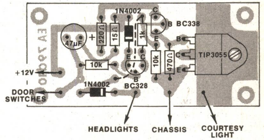
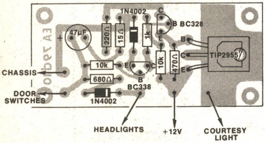


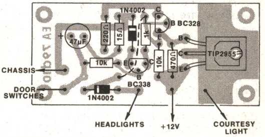
FIG. 4





At top left is the PCB component layout for Fig. 1. Below left, is the component layout for Fig. 3 while at top right is the component layout for Fig. 2. Below right is the component layout for Fig. 4. The PCB pattern was published in the January 1980 issue.





polarity. All component polarities are changed, PNP for NPN and vice versa and the supply connections to the PCB are reversed.

The final variation of the design is own in Fig. 4. This design is suitable use in cars which have the door ches on the active side of the tesy lights and also have the ight switch between the headlights and the positive side of the battery.

Fig. 4 is very similar to Fig. 3 but swaps the diode over so that it is connected to the base of Q2 (as in Fig. 2). Again, the 680 ohm resistor in series with the diode is no longer necessary and may be omitted.

So far we have not dealt with positive chassis vehicles and those with 6V batteries such as pre-1968 VWs. With the four circuit variations presented, readers will find one that can be adapted for use in their particular positive chassis vehicles. Similarly, all the circuits are applicable to 6V operation without changes.

We have produced a component layout diagram of the PCB for each of the four circuit variations. Those circuits of Figs. 2 and Fig. 4 which require the diode to be connected to the base of Q2, each have a wire link installed underneath the PCB. Note also that the "+12V" and "chassis" connections to the circuits of Figs. 3 and 4 have been swapped over.

PARTS LIST

1 TIP3055 or MJE3055 NPN power transistor (versions 1 and 2)
1 TIP2955 or MJE2955 PNP power transistor (versions 3 and 4)
1 BC338 NPN transistor
1 BC328 PNP transistor
2 1N4002 or similar silicon power diodes
1 47uF/25VW electrolytic capacitor
1 PCB, 87mm x 38mm, code 79d10

RESISTORS:
¼ or ½ watt unless specified
2 x 10k, 1 x 1k, 1 x 680 ohm (see text), 1 x 470 ohm, 1 x 220 ohm 1W, 1 x 15 ohm

MISCELLANEOUS:
Hookup wire, 3A fuse and fuseholder, stand-off pillars, machine screws and nuts, automotive connectors

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.

The installation of the circuit is as described in the January issue, regardless of whether the headlights are operated directly from the dashboard switch or via a relay. Make sure that the +12V supply is derived from the active side of the dashboard switch.

Also note that two alternative power transistors are given for both the NPN and PNP versions. The TIP prefix comes in a SOT 93 package, and the lead configuration is as shown. The MJE version is in a TO 127 package, with the positions of the base and emitter leads swapped over. When using this transistor it must be installed face down on the circuit board, so that the leads are in the correct positions. Use a metal washer under the head of the securing screw to improve heat transfer between the transistor mounting base and the PCB copper pattern.

Well, there it is. Four variations of a simple design to make it suitable for fitting to just about every variety of car lighting system. Just pick the design that suits your car and look forward to a little extra convenience in your motoring. ⓔ

Consult the experts with over 25 yrs in the field.

WE HAVE WHAT YOU WANT

LOOK / Colour Specials Hills Antennas:

EFC2	$58.33
EFC3	89.00
TL2	41.20
TL3	50.62
TL4	54.80
Airways Anti Ghost	77.74
104/0 great for DX	37.78
6/1 another for DX	41.98
Channel Master	
5/0 for DX 5 EL	44.30
Rotator complete	99.00

Mast Head Amplifiers	
Hills MH4	$75.78
E/Craft MH22	82.62
Kingray MH20	82.62
Hills Antennas	
215 8 EL	30.66
CY7	36.76
CA16 Phased array	58.67
Channel Master	
3615-9 element	44.84
3614-13 element	62.54
3613-17 element	81.91
3612-21 element	98.06
3610-24 element	127.87
3617-28 element	152.67

SAVE "DOLLARS" on Coaxial Cable. Ring now for the best Prices and Cable in Australia.

FREE ADVICE GIVEN:

ELECTROCRAFT MFG P/L
68 Whiting Street, Box 398, ARTARMON 2064.
Phone Now: 438 4308 Ex 6. Hours — Monday to Friday 8am-5pm.

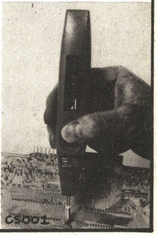
Cordless Soldering . . .

Now you get *fast* recharge ~ WITH **Wahl Iso-Tip Soldering Irons**

The lightweight Wahl regains full operating capacity in about four hours, so the number of soldered joints produced in a workday can be greatly increased.

- Heats in 5 seconds
- Up to 150 joints per charge
- Long life ni-cad batteries
- Choice of quick-change tips
- No leakage or induced current
- Exclusive "lock-off" switch
- Spotlight illuminator
- Vehicle adaptor available

* For bench use, this recharging stand is available.



From your Electronics Parts Supplier or

Royston Electronics
(02) 709 5293 (07) 44 0131
(03) 543 5122 (08) 42 6655
(002) 34 2233 (09) 381 5500

STANDARD COMPONENTS PTY. LTD.

Wholesale Trade Supplied

STANDARD COMPONENTS PTY. LTD.
SC
MANUFACTURERS & DISTRIBUTORS TO THE ELECTRONICS INDUSTRY

108 PAGES PACKED FULL OF ELECTRONICS

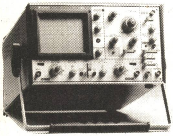
1980 CATALOGUE

$3.00 PLUS 50c Postage

Standard Components Pty. Ltd. 10 Hill St., Leichhardt 2040
660-6066

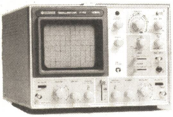
See for yourself...THE PORTABLE OSCILLOSCOPES

Now in Australia – produced by Hitachi Denshi, Ltd. Japan



V-550 50MHz DUAL TRACE DELAYED SWEEP

Large bright 8 x 10cm screen
High sensitivity 1mv/div (10MHz)
Five ns/div sweep rate
3rd channel display (trigger view)
Variable trigger hold off
Full TV triggering
Single sweep
Automatic focus correction



V152 15 MHz DUAL TRACE

TV sync-seperator circuit
High-sensitivity **1mV/div** *(5MHz)*
X-Y operation
Sweep time magnifier (10 times)
Trace rotation
Z-axis input (intensity modulation)

There are five great Oscilloscopes by Hitachi Denshi Ltd., Japan now available in Australia from Standard Components. In addition to the models illustrated there are the V-151 15MHz single trace, V-301 30MHz single trace and V-302 30MHz dual trace. All feature wider band width, more compact design with light weight.

Circuitry with linear IC's and logic IC's plus modern manufacturing techniques including automatic component — insertion machines making for increased stability, improved reliability, excellent performance and enhanced operating ease.

One other great feature of Hitachi Oscilloscopes is price. Phone for details.

All Hitachi Oscilloscopes sold in Australia are solidly backed by good service and spare parts and are guaranteed for a full twelve months.

Also available from:— Radio Parts Group, G.B. Telespares, Ellistronics **(Melbourne)**; Audiotronics **(Brisbane)**; David Reed, Radio Despatch **(Sydney)**; Bee-Jay **(Adelaide)**; and other leading Electronic Shops.

Standard Components Pty. Ltd.

10 HILL ST., LEICHHARDT 2040. 660-6066

ROD IRVING ELECTRONICS

499 HIGH STREET, NORTHCOTE 3070, melbourne victoria. ph. (03) 489 8131

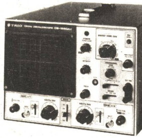
TRIO CRO'S NOW IN STOCK

(write for full product range and price list)

CS-1560AII

130 mm DUAL-TRACE
15 MHz, TRIGGERED
SWEEP OSCILLOSCOPE

- **Bandwidth**
  DC ~ 15 MHz
- **Sensitivity**
  10mV/div
- **Sweep Time**
  0.5 μs/div ~ 0.5 s/div



$555.00 Plus Tax

• Simplified circuitry improved performance and dependability have been successfully realized with the use of ICs throughout • A vertical amplifier provides as wide a bandwidth as DC to 15 MHz, as high a sensitivity as 10 mV/div, and a low input capacitance • A sweep rate extends from 0.5 μsec/div to 0.5 sec/div in 19 ranges. Further, TV vertical and horizontal syncs are available for measuring video signals and, with its x5 magnified sweep, its range of application is extremely wide • Very easy X-Y operation of high input sensitivity for Lissajous measurements • Dimensions: 260(W) x 190(H) x 385(D) mm, Weight: 8.4 kg

OPTO LEDS

LED	Red Rectangle	.22c
LED	Green Rectangle	.30c
LED	Yellow Rectangle	.25c
133	Red Chrome	$1.00
133	Amber Chrome	$1.30
133	Green Chrome	$1.30
LED	Red Standard	.13c
LED	Green Standard	.23c
LED	Yellow Standard	.23c
SAR3431	Red Miniature	.18c
CS205	Green Miniature	.25c
CS206	Yellow Miniature	.25c

bankcard welcome here

Bankcard Mail Orders Welcome

Pleae debit my Bankcard.

Bankcard No. .... Expiry Date ....

Name ....

Signature ....

HEAVIER ITEMS ADD ADDITIONAL POSTAGE. EXTRA HEAVY ITEMS SENT COMET FREIGHT ON PRICES SUBJECT TO CHANGE WITHOUT NOTICE. SEND 60c & SAE FOR FREE CATALOGUE.

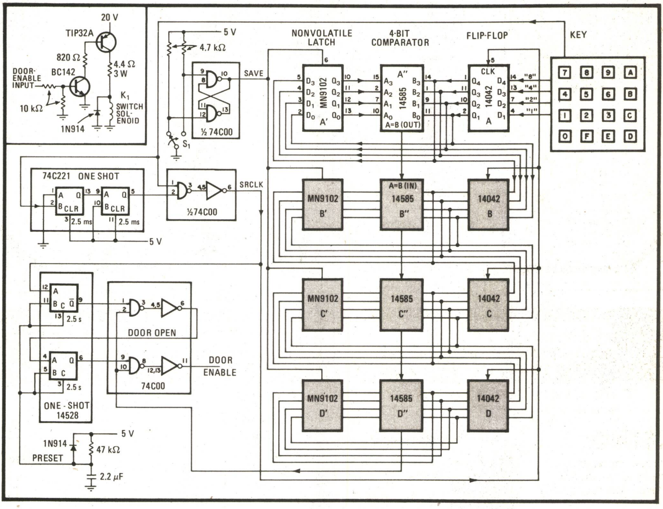
MAIL ORDERS: PO BOX 135, NORTHCOTE, VIC 3070.
MIN. PACK & POST $1.25. P & P ON TRANSFORMERS MIN. $5.00

CIRCUIT & DESIGN IDEAS

Interesting circuit ideas and design notes selected from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Contributions to this section are always welcome, and will be paid for if used.

Conducted by Ian Pogson

Electronic security lock has non-volatile latch memory



Non-volatile quad latches serve as the memory bank in this electronic security lock, which can be programmed with any one of more than 65,000 possible four-digit combinations. The number of combinations that can be selected for opening the lock can be greatly increased, simply by cascading the latches and their corresponding control circuitry.

The desired four-digit combination is stored in the Plessey MN9102 latches by first entering the number via the keyboard, which provides a hexadecimal output. If the code were 3579, digit 3 would first be introduced to the D input of flip-flop A. At the same time, the signal KEY, which indicates contact closure, is generated. KEY produces clock signal SRCLK, generated by a monostable multivibrator, which prevents keyboard bounce and which clocks 3 into A.

Because the outputs of each flip-flop, n, are connected to the D inputs of the next flip-flop in the line, n + 1, the successive introduction of the remaining digits translates the digit 3 from A to flip-flop D, with the end result that 5 will be in flip-flop C, 7 in B, and 9 in A at the conclusion of the sequence. The outputs of A to D are also connected to latches A' to D' respectively, and so by activating switch S1 momentarily in order to generate the SAVE signal, the digits can be stored in their corresponding latches.

Data can be be retained in the latches for at least one year in the absence of applied power (+5V, -12V). Typically, 10 million save operations can be made before device performance is affected.

In actual operation, the first digit keyed in is compared with the 9 stored in A', at comparator A". Assuming the first digit keyed is a 3, there will be no output from the A = B port of the comparator. Neither will there be any output from B" or C" as the digits 5 and 7 are entered.

As the final digit, 9, is entered however, digit 3 is placed in D, 5 moves to C, and 7 is stored in B. All comparators therefore indicate A = B, and a door enable signal is generated, thereby activating K1 after a user-selected delay provided by the 14528 one-shot.

(By Ray Oakley, in "Electronics".)

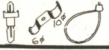
CQ electronics

and get your components

SHOP 9, TOWN CENTRE
30 CAMPBELL STREET
blacktown.
621 5809

95 REGENT STREET
CENTRAL RAILWAY
sydney.
698 8079

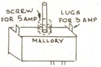
PCB NYLON STANDOFFS	25 FOR $1.00
DUAL CABLE CLAMPS	10 FOR $1.00
NYLON CABLE TIES	25 FOR $1.00



Z80 MICRO CHIP	1 FOR $11.00
8085A MICRO CHIP	1 FOR $10.00
MM5303 UART	2 FOR $ 8.00
8251A UART	2 FOR $ 9.00

MALLORY CIRCUIT BREAKERS

1.95A HOLD AND 3A BREAK	$1.50
3.25A HOLD AND 5A BREAK	$1.50



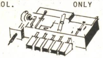
MINATURE DPDT TOGGLES	$1.00
MINATURE SPDT CENTRE OFF	$1.00
275mm DPDT SLIDES	6 FOR $1.00

AUTO CONNECTORS	20 FOR $1.00

EMI TV MODULE CONTAINING MANY PARTS INCLUDING BC148, LM3065N, BF336, OC925, BF198, BF199, WITH EIGHT 5mm COIL FORMERS AND SLUGS BOARD IS 20x12 cm. ONLY $3.50

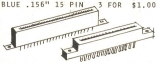
EMI TV MODULE CONTAINING MANY PARTS INCLUDING BF198, TAA570 IC BF184, BC547, BF336, AND SIX 8mm COIL FORMERS AND SLUGS. BOARD IS 30x10 cm. ONLY $4.00

CAR RADIO TUNING GANG WITH THREE COILS, FIVE PUSH BUTTONS, ROTARY CONTROL. ONLY $2.25



EDGE CONNECTORS

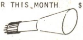
RED .1" 38 PIN	3 FOR $1.00
BLUE .156" 15 PIN	3 FOR $1.00



15 OHM STUD THERMIST.	5 FOR $1.00
1mH RF CHOKE	1 FOR $1.00
MINATURE CERAMIC TRIMMERS	
¤ 2-5 pF	5 FOR $1.00
¤ 2-6 pF	5 FOR $1.00
¤ 3-10 pF	4 FOR $1.00
¤ 3.5-13 pF	4 FOR $1.00
¤ 4-20 pF	3 FOR $1.00
¤ 4.5-20 pF	3 FOR $1.00
¤ 10-40 pF	3 FOR $1.00

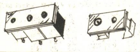
CIGARETTE LIGHTER PLUG WITH A FUSE, THREE METRE CORD AND A TWO PIN TV PLUG. ONLY $2.25

3BP1 OSCILLOSCOPE TUBE AND COPY OF A CIRCUIT FOR A TRANSISTORISED SCOPE FROM PRACTICAL WIRELESS SPECIAL FOR THIS MONTH $10.50



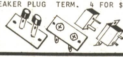
COMBINATION SOCKETS

3.5+3.5+2.5 SOCKET	10 FOR $1.00
3.5+2.1 DC SOCKET	10 FOR $1.00



0-9 NUMBERED KNOB	4 FOR $1.00

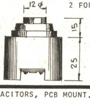
SPEAKER PUSH TERM.	4 FOR $1.00
SPEAKER SCREW TERM.	10 FOR $1.00
SPEAKER PLUG TERM.	4 FOR $1.00



6.3V 200mA GLOBES WITH 15mm LEAD
25 FOR $1.00 OR 100 FOR $3.00
FLAT GREEN PUSH BEZEL FOR GLOBE;
12 FOR $1.00 OR 50 FOR $3.00
PROTRUDING GREEN PUSH FIT BEZEL;
8 FOR $1.00 OR 33 FOR $3.00

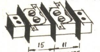
45mm.	SINGLE GANG	SLIDE POTS
2K	LINEAR	6 FOR $1.00
10K	LINEAR	6 FOR $1.00
50K	LOG	6 FOR $1.00
100K	LINEAR	6 FOR $1.00

HEAVY DUTY PUSH SWITCH. 25.4mm, HOLE MOUNT, BLACK, GREEN AND RED 15mm BUTTON, BLACK BODY. MAY BE USED AS MOM PUSH ON OR MOM PUSH OFF. 2 FOR $1.00



BARRIER TERMINAL STRIPS

B2	2 TERMINAL LARGE	5 FOR $1.00
B4	4 TERMINAL LARGE	4 FOR $1.00
B6	6 TERMINAL LARGE	3 FOR $1.00
B8	8 TERMINAL LARGE	2 FOR $1.00
B10	10 TERMIN. LARGE	1 FOR $1.00
BS2	2 TERMINAL SMALL	5 FOR $1.00
BS4	4 TERMINAL SMALL	4 FOR $1.00



AEE CAPACITORS, PCB MOUNT.

.047uF	400V	10 FOR $1.00
.1 uF	400V	8 FOR $1.00
.22 uF	250 V	7 FOR $1.00
.27 uF	250V	6 FOR $1.00
.33 uF	100V	7 FOR $1.00
.33 uF	250V	6 FOR $1.00

20V VOLTMETER 60x80mm	$10.50
10A AMMETER 60x80mm	$10.50

TO3 TRANSISTOR COVER	5 FOR $1.00
TO3 INSULATING KITS	5 FOR $1.00

ALL THE FOLLOWING VALVES AT THE COST OF ONLY $1.00 EACH........ 1B3GT, 6AL5, 6BX6, 6CW7, 6EM5, 6ES8, 6AN8A, 12AU7, 6V4, 6BQ6, 6BA8, 6BQ7, 19Y3, 6DQ5, 6BK4, 6GW8, 25Z6, 12AE6.

Capacitors and resistors, integrated circuits, Wires and cables, semiconductors, fuses, knobs Radio and TV valves, plugs and sockets, pots Manufacturers of PC boards and disco lighting.

Prices subject to change without notice
Pack and postage within Australia: $1.00

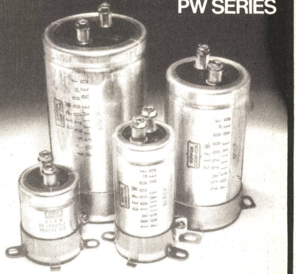
02-621 5809

WRITE
CQ ELECTRONICS
30 CAMPBELL ST
BLACKTOWN 2148

bankcard
welcome

SOANAR

PW SERIES



COMPUTER GRADE ELECTROLYTICS

PW Series Capacitors are particularly suitable as power source filters for computers, inverters, high current power supplies, high output power amplifiers and control equipment.

Despite their small size, these capacitors have exceptionally large capacity and are capable of handling high ripple currents. Miniaturisation has been achieved by the use of new electrode foils developed from a technique of high magnification etching.

Construction includes an aluminium can which is sealed with a long life, heat resistant resin and heavy duty screw terminals for handling the high currents involved. Mounting clamps are supplied as standard equipment.

2,900uF TO 100,000uF
16 Volt TO 40 Volt DCW

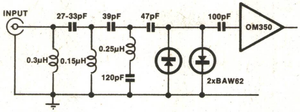
Available ex stock all States

SOANAR ELECTRONICS PTY. LTD.
A MEMBER OF THE A+R-SOANAR ELECTRONICS GROUP
30 Lexton Road. Box Hill. Vic., 3128.
Australia. Telex: 32286.

SALES OFFICES
VICTORIA 89 0661
NSW 789 6733
STH AUST 51 6981
QUEENSLAND 52 5421
WEST AUST 381 9522

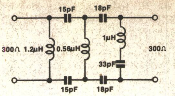
SOANAR GROUP

High-pass filter for Mast-Head Amplifier



I read your article on the Mast-Head Amplifier in the August, 1979 issue of Electronics Australia with interest but I was surprised to note that you had not included a high pass filter at the input of the device. On experimenting with similar devices in the Philips range it was found that even though their nominal frequency range is 40MHz to 860MHz, they do in fact often have no more than 2dB variation in gain between 10MHz and 1.2GHz. This means that they will respond very well to HF amateur and to 27MHz CB transmissions.

These problems can be cured quite readily by fitting a suitable high pass filter ahead of the amplifier.



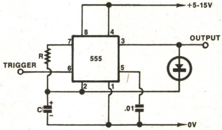
I have constructed a number of 300-ohm balanced filters and I have found it desirable to use a combination of constant-K and M-derived filters with a notch in the 27-29MHz range. I achieved over 35dB of attenuation below 30MHz and at the notch frequency about 55dB. Below about 10MHz at least 55dB of attenuation was achieved. The circuit of the balanced filter is shown. Also, a suggested unbalanced filter for coaxial cable which should suit the amplifier is also shown. The cut-off frequency of the filters which I constructed was 45MHz, with an insertion loss of no more than 1dB worst case.

(By Mr R. D. Champness, VK3UG, 31 Helms Court, Benalla, Vic 3672.)

555 timer triggered by positive pulses

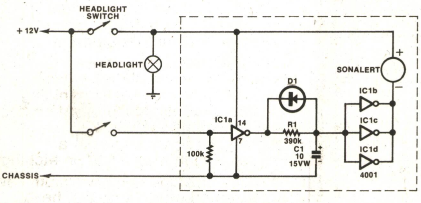
The 555 timer IC is naturally suitable for monostable operation, triggered by negative pulses. However, it is sometimes more convenient to trigger it from positive pulses. With the addition of a diode, the standard circuit can be modified to do this.

In the normal monostable mode the 555 output sits low and is sent high by a negative pulse at pin 2, for a predetermined period equal to 1.1RC. In the circuit as shown, the output sits high and is sent low for the same period by a positive pulse at pin 6.



(By Mr G. Roberts, 20 Warrabri Place, West Pymble, NSW 2073.)

Headlight minder saves battery discharge



Having recently had a number of flat batteries due to leaving my headlights on when parking the car, I have designed a headlight minder that will emit a high pitched sound when the headlights are left on with the ignition turned off.

This circuit differs from the usual in that it does not have the annoying characteristic of sounding immediately the ignition is switched off. I have incorporated a five second delay to give the driver time to switch the lights off.

Referring to the circuit diagram it may be seen that the circuit gets its power from the headlight circuit so that when the lights are off, the system is disabled. When both lights and ignition are on the system is also disabled. However, when the ignition is turned off, the junction of R1C1 slowly rises and turns on the Sonalert. The turn on delay is approximately five seconds with the values of R1 and C1 as shown. The diode, which may be any type, has been included to ensure that when the ignition is turned on, the junction of R1C1 discharges immediately, thereby stopping the Sonalert from sounding straight away.

The prototype was built into a small die-cast box and mounted under the dashboard. (By Mr M. Hillman, 4/8 Buller Street, Artarmon, NSW 2064.)

AKAI

GENUINE REPLACEMENT PARTS

We have over $100,000 worth of genuine AKAI parts for recorders and amplifiers.

AKAI service manuals for most models only $8 ea post free.

Phone enquiries 516 4599.

All correspondence to:

The Maurice Chapman Group,
44 DICKSON AV,
Artarmon, NSW
TELEX AA 25011

Basic Electronics

Buzz Bar

How good do you think your co-ordination is? Here is a game that you can build to test it. All that you have to do is to move a small wire loop over a bent wire while touching it as little as possible, or preferably, not at all. If your skill is inadequate, the circuit lights a lamp or sounds a buzzer (or both).

by GERALD COHN

Most people tend to snort when they see this game, saying, "That's so easy, I could do it with my eyes shut!" That is what they think until they try it. And again. And again. What do you know? It's a lot more difficult than it looks. And the "course" can be made easy or tortuous — just a few simple bends or maybe a couple of spirals to make it even more challenging.

Our version of the game is simple but it can be made more complex. It has a light and buzzer to tell when you have failed the course, a control to vary the amount of skill required to negotiate the course and an on-off switch.

Let us take a look at the circuit. Basically, it is a delay timer, based on a 555 IC, which adds up the time for which the metal loop is in contact with the wire. If the total time is more than that selected by the skill control, the timer lights a lamp and sounds a buzzer.

The main timing component in the circuit is a 50uF tantalum capacitor which has low leakage. The timing resistor is a series combination of the 100k potentiometer and the 6.8k resistor between pins 6 and 7 of the 555 IC. At the minimum setting of the potentiometer, the maximum time that the loop can be in contact with the bar is approximately 0.4 seconds and at the maximum setting, the time is approximately 4 seconds.

It may be thought that if the player was to move the loop very slowly and carefully along the bar, he would have less contact with it, and thus more chance of traversing the length of the bar before he is "buzzed". But we have thought of this too. The 180k resistor sets the maximum time, in which the player is allowed to complete the course, to 12 seconds.

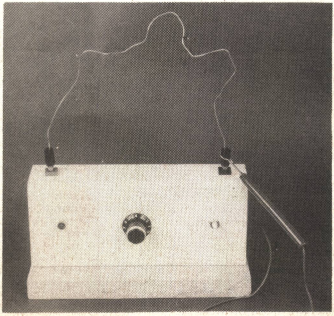
Thus there are two requirements to be met by the player. He must allow as little as possible contact between the bar and the loop, with a margin for error set by the skill control, and he must complete the course within a given time period, 12 seconds. There is a catch here however, 12 seconds are allowed to complete the course, but each time the metal loop touches the buzzbar the remaining traverse time is correspondingly reduced. So that the more the loop touches the bar, the less time is left to complete the course before the failure light and buzzer come on.

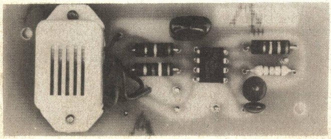
The 180k resistor can be replaced with a variable one, say 500k, allowing the player to vary the traverse time. The skill control potentiometer can also be replaced by a fixed resistor, thus allowing a fixed time that the loop can be in contact with the bar, by providing variable control of the traversal time. Another way to make things a little more exciting is a set of differently shaped buzzbars which can just be plugged into place (see photograph).

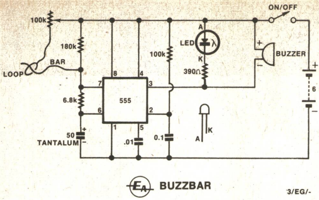
The lamp that we used to indicate failure is a light emitting diode, mounted into the front panel with a black plastic bezel. The 390 ohm resistor in series with the LED limits the LED current to about 20mA.

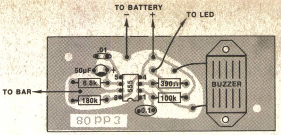
A 6V or 9V battery can be used without any changes to the circuit but we chose the miniature 9V battery since it is compact and low in cost. Note that if the lower voltage is used, no timing inaccuracies occur since the circuit is largely independent of changes in

Shown below is the completed PCB. The buzzer is mounted on the board with two 6BA screws. The photograph to the right shows the finished game.





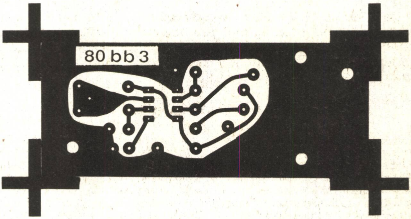




Left: the circuit of the Buzz-Bar based on the 555 timer IC. Above: the component overlay diagram. Take care with the polarities of the tantalum capacitor and the IC. Below: an actual size reproduction of the PC pattern.

supply voltage.

Operation of the circuit is quite straightforward. Initially no voltage is applied to the load while the timing capacitor is charging towards Vcc (the supply voltage). When the voltage across the capacitor reaches 2/3Vcc the timer trips and applies almost all of the supply voltage to the load. It also discharges the timing capacitor via the 6.8k resistor. The circuit then remains in this condition, with voltage applied to the load until a negative trigger pulse is applied to pin 2. One way to do this would be to have a momentary contact push-button short out the capacitor at pin 2, but the same thing is achieved by switching the supply off and then on again.



We estimate that the current cost of parts for this project is approximately

$10.00

This includes sales tax.

PARTS LIST

- *1 Printed circuit board, code 80bb5, 35 x 87mm.*
- *1 555 timer IC*
- *1 Red LED and mounting bezel to suit*
- *1 100k linear pot.*
- *1 single pole miniature toggle switch*
- *1 Buzzer type DM-03 or similar*
- *1 Battery 9V, type 216 and clip to suit*
- *2 banana plug sockets*
- *2 banana plugs*

RESISTORS (all ½w 5%)

1 x 390 ohm, 1 x 6.8k, 1 x 100k, 1 x 180k

CAPACITORS

- *1 x 50uF 6VW tantalum*
- *1 x 0.01uF metallised polyester*
- *1 x 0.1uF metallised polyester*

MISCELLANEOUS

4 PC pins, timber, aluminium, solder, hook-up wire, screws, nuts, etc.

Whenever the circuit is switched on, a negative pulse is effectively delivered to pin 2 and thus sets the timing cycle in motion. The game can now start with the player trying to traverse the bar without touching it with the loop, if this is at all possible.

Construction of the unit is simplified through the use of a printed circuit board (coded 80bb5) measuring 35 x 87mm. The component overlay diagram shows the placement of the various components. Take care when mounting the IC and the tantalum capacitor to ensure that the orientation of these is correct. The buzzer that we used is the same as that in the headlight alarm which appears elsewhere in this issue. Since the buzzer is also polarity conscious, care will have to be taken to ensure that the red and black leads are properly connected.

The external connections to the PCB were made using PC stakes. We recommend the use of these stakes as they make the wiring to the board easier. The buzzer is mounted directly on the PCB and held in place with two 6BA screws. These tap into the plastic lugs on the buzzer's case.

Construction of our prototype was kept simple but undoubtedly it could be made simpler still. The circuit is not at all critical as far as layout is concerned. We used a piece of pineboard measuring 210 x 160mm as a base, and attached a U-shpaed piece of aluminium to it to function as a front panel.

The buzzbar was made from a length of 16-gauge tinned copper wire soldered to two banana plugs which were then inserted into two sockets mounted along the top of the front panel. With this arrangement, the bar can be easily substituted for one that is either more challenging or one that it is easier to follow.

The loop is also made of tinned copper wire, with the loop being of sufficient diameter to just fit over the insulated portion of the banana plug. We soldered our loop to the end of a meter prod which is then connected by a length of hookup wire to the appropriate point in the circuit.

Some readers may feel that the "failure" light could be more appropriately mounted on the top of the panel so that it is more visible to the player. It may also be possible to place a N/O contact push-button switch across the capacitor at pin 2, and use this to reset the circuit, obviating the need to turn the unit off, although turning the unit off and then on again is the cheaper way. Just a reminder here that the timing capacitor must be a low leakage type (tantalum). The leakage of the typical aluminium electrolytic is too high to allow the circuit to function properly.

Whatever way you decide to build it, we are sure you will agree with us in thinking that it's a fun project.

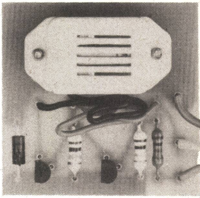
An end to flat car batteries with our

Headlight Reminder Alarm

Basic Electronics

by GERALD COHN

Ever had a flat battery in the car because you had left the headlights on? If so, then you know how inconvenient it is and how expensive it can turn out to be. There is a way to avoid this inconvenience and possible expense, with our simple, yet effective Headlight Reminder Alarm.



All the components are mounted on a PCB. The buzzer is held in place by two 6BA screws.

The simple alarm that we are presenting here evolved some years ago purely from the need to preserve the battery in the author's car (he has a habit of leaving the headlights on in rainy weather). The unit is simple to build and consists of two transistors, a diode, a few resistors and a buzzer.

The principle behind the idea is simple — if the headlights are turned on while the ignition is turned off, the alarm will sound. In this way, when you park your car and turn off the engine before switching off the headlights, you know about it. What could be simpler?

When it came to actually designing the alarm, a few things had to be considered. Firstly, the unit should be as simple as possible, both in construction and installation, and secondly, the cost should be as low as possible.

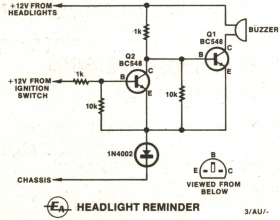
The final design that evolved from our efforts is the circuit shown in Fig. 1. As you can see, there is not very much to it at all, just a couple of dollars worth of bits, most of which are to be found in the average hobbyist's junkbox anyway.

Operation of the circuit is quite simple and there are only three connections required to be made to the wiring of the car. These are: a connection to the switched side of the headlight (or parking light) circuit; a connection to the ignition switch and a connection to the chassis of the car.

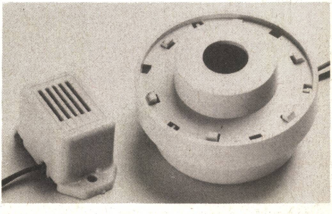
Now, if you start the car, the base of Q2 is forward biased. If the headlights are now switched on, a current will flow in the 1k resistor and in the collector of Q2. Q1 is switched off since there is no forward base-emmitter bias, this being shunted to ground by Q2. If however, the ignition is now turned off while the headlights remain switched on, Q2 switches off allowing Q1 to switch on and sound the buzzer. The buzzer will continue to sound for as long as the headlights are left switched on.

Incidentally, note that the power for the buzzer is obtained from the headlight circuit of the car, and when the headlights are not in use, no power is drawn by the circuit.

The 10k resistors connected from the



The circuit of the Headlight Reminder Alarm uses few components, but could save you the inconvenience of a flat battery. Fitting it to the car is simple — only three connections are required.



This photograph shows two types of audio alarm suitable for use with our circuit — a vibrating reed type (left) and a piezo type (right). We used the reed type in the prototype.

bases of Q1 and Q2 to the negative supply ensure that the transistors are fully turned off, when their bias is removed.

The diode in series with the chassis connection is to protect the transistors in the event of the unit being inadvertently connected with reversed polarity.

The unit can be made to work in a positive chassis car if this is desired. All that needs to be done is to reverse the diode and to replace the two BC548s with their PNP complements, BC558s.

The buzzer that we used has an internal oscillator which drives a coil and tuned reed assembly. The oscillator circuit is protected from polarity reversal by a series diode. Because of the fact that the buzzer has an internal driver oscillator, it is not necessary to connect a diode in parrallel with it to protect Q1.

The buzzer is made by a number of different manufacturers and the part numbers do not match up from one manufacturer to the next. The type that we used in the prototype is coded DM-03 and can be obtained from Dick Smith Electronics and other parts suppliers.

Parts List

1 Printed circuit board, 80hla5, 47 x 45mm
1 Buzzer, type DM-03 (see text)
2 BC548 NPN transistors (negative chassis version)
1 1N4002 or similar diode
2 x 1k resistors ¼ or ½W
2 x 10k resistors ¼ or ½W
Automotive hookup wire, solder, screws etc.

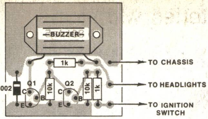
Construction of the unit should only take half an hour or so, all the components being mounted on a PCB, this being coded 80hla5 and measuring 47 x 45mm.

The first components to go on the PCB should be the resistors, followed by the diode and then finally the transistors. The buzzer is mounted on the PCB using 6BA screws — we used 6BA because these tap right into the buzzer's mounting lugs, holding it quite firmly in place.

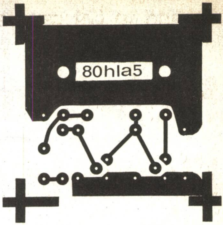
Remember that if your car happens to have a positive chassis, that the diode must be reversed and the BC548 transistors must be replaced with BC558s which are PNP.

Having mounted all the components and checked for errors, it is a quick and simple procedure to test the unit. If you happen to have a 9V battery to hand, this will do just fine for the test.

Assuming that you have constructed the negative chassis version, connect the chassis lead to the negative terminal of the battery. Now, take the lead for the headlights and touch it onto the positive terminal. The buzzer should now sound. If all is OK at this stage, then touch the ignition lead onto the positive terminal while still holding the other two leads in place. The buzzer should now stop. Removing and replacing the ignition lead on the positive terminal will now cause the buzzer to stop and start.



This overlay diagram shows the placement of the various components on the PCB.



Here is an actual size reproduction of the PCB pattern. PCBs should be available from the usual suppliers by the time you read this article.

We estimate that the current cost of parts for this project is approximately

$5.00

This includes sales tax.

If the unit passes the test, all that remains to be done is to house it in a container of some sort. We have not described a container here since the mounting requirements of the unit can vary quite significantly from one car to the next.

The best place to mount the unit is just under the dashboard, as close to the main wiring harness as possible. The connections to the car wiring can be done in one of two ways; by using piggyback spade connectors or by using "Scotchlok" splice connectors.

If the location you have selected is close to the fuse box, then a quick check of the back of the fuse box will determine whether spade connectors will be suitable for the connections. If the fuse box is inaccessible, then the "Scotchlok" splices will be required.

Trace the wiring from the switched side of the headlight (or parking light) switch and clip one of the splices over the wire. Now, take the headlight lead of the alarm and slide this into the other side of the splice clip and using a pair of pliers squeeze the metal tab until it is firmly seated.

When you are satisfied that the connection has been made, fold the plastic insulating tab over until it clicks into place. This completes the connection. The same procedure is followed for the connection into the ignition circuit. The chassis connection can be made to any convenient point under the dash, but make sure that the point you select is in fact at chassis potential and not insulated.

When you have mounted and connected the unit to the wiring of the car, switch on the headlights and make sure that the buzzer sounds. Turning the ignition on (generator light on), should stop the buzzer.

Well, there you have it, a simple gadget that can save you both time and money. Happy motoring!

IF YOU PROGRAM MICROPROCESSORS, THESE SHEETS ARE FOR YOU

Writing microprocessor programs on blank or plain ruled paper is messy and time consuming. To make the job easier, Electronics Australia has produced custom-designed programming sheets for use with virtually any microprocessor system. The sheets feature columns for a 4-digit address, up to six digits of instruction code or data, labels, mnemonics, and comments. There is space for 46 lines per sheet, and the sheets are provided with space for program title, date and sheet number. All for less than 5 cents per sheet, posted!

PRICED AT $2.00 FOR 50 SHEETS
(plus 40c for postage anywhere in Australia)

Available only from Electronics Australia,
57 Regent St, Sydney (P.O. Box 163, Beaconsfield, NSW 2014)

Letters to the editor

Slamming the NCRA

I wish to reply to the article by Mr Jan Christensen (National Liaison Officer of the National Citizen's Radio Association of Australia) in the February 1980 edition of "Electronics Australia."

Firstly there is repeated reference to the Citizen's Band Radio Service which is incorrect. The word "Band" is an addition by the NCRA to try and claim the present 27MHz frequency allocation as a right because similar allocations have been made in other countries.

However, Mr Christensen points out that communication is only permitted within Australia and its Territories so there is no case for the retention of the 27MHz allocation.

The NCRA complains that "so little is being done" for the $25 licence fee but if the statement "We have ALL paid our $25 a year" was true much more could and would be done.

To say that it is "criminal" to deprive "the citizens of Australia" of the 27MHz allocation is ridiculous because Mr Christensen later advocates that we "demand our rights" or "be forced back to being pirates once more".

That is equivalent to saying that burglars are entitled to go back to robbing banks because they object to the laws governing security of property. We are talking about the laws governing security of communication.

How many ardent CRS operators obey the regulations? Spectrum anarchy exists with users openly advertising units for sale with 800 channels, 1kW linear amplifiers, beam antennae, etc.

I suggest that the NCRA should put the CRS house in order first before demanding "our rights". CRS operators, both male and female, should "clean up their act". When all CRS operators remain in the allocated frequency spectrum, use no more than the permitted maximum power into non-gain antennae and obey all the operating rules relating to call signs, licences, obscene language etc then they can be regarded as a responsible body to whom extra facilities can be granted.

Until then, I would point out that upon entering the CRS on 27MHz all operators were made aware of the termination date of June 30th, 1982 and if they bought equipment hoping the regulations would be changed that is their affair.

(Name and address supplied but withheld at the writer's request).

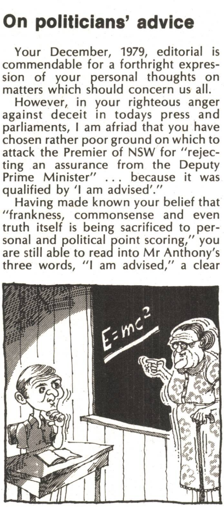
COMMENT: The writer presumably sent a similar letter to Jan Christensen. Her comments appear in "The Australian CB Scene" elsewhere in this issue.

On politicians' advice

Your December, 1979, editorial is commendable for a forthright expression of your personal thoughts on matters which should concern us all.

However, in your righteous anger against deceit in todays press and parliaments, I am afriad that you have chosen rather poor ground on which to attack the Premier of NSW for "rejecting an assurance from the Deputy Prime Minister" ... because it was qualified by 'I am advised'."

Having made known your belief that "frankness, commonsense and even truth itself is being sacrificed to personal and political point scoring," you are still able to read into Mr Anthony's three words, "I am advised," a clear and, presumably frank, statement that this advice came from "scientists who understand the working of a nuclear reactor."



"Now have you got that, Douglas?"

May I point out that the Deputy Prime Minister's "I am advised" holds good if it emanates from his Great Aunt Jemima, should he possess one?

I side with R.P.'s advice (Forum, Feb. '80) that EA should refrain from "entering into the political arena". Your denial of this charge is extremely weak. R.P. did not accuse you of political bias but of entering into the political arena. To say that your criticism would have been the same had the personalities been reversed does not refute the specific charge. Surely, there is enough material to discuss in EA, including its editorial, that is relevant to the magazine's real purpose?

H. Sadler,
Bulolo, PNG.

COMMENT: If there was the slightest suspicion that the Deputy Prime Minister had turned for advice to a (presumably) unqualified maiden aunt, we would back down immediately!

Loudspeaker review

Thank you for an informative and detailed review of our Peerless "PAS 50" Loudspeakers (December, 1979). We noted your valued comments and advise as follows:

(a) Lack of identification was an oversight on our part and we enclose a copy of the label which is now fixed on the rear of each speaker above the terminal block.
(b) We have now secured better prices for all 'PAS' Series speakers and advise that the recommended retail price is now $498 a pair.
(c) Our experiments have shown that a small plinth at least 150mm high does improve the rightness and smoothness of the bass response. This however is very subjective and requires experimentation in the home.
(d) The description "synthetic veneer" implies, in our interpretation, a vinyl or similar material. We would like to state that the veneer is genuine Australian Walnut veneer.

We hope you can find space to print our response to your comments.

D. W. Cale,
G.R.D. Group Pty Ltd,
Camberwell, Vic.

Technology vs. Humanities

Kudos to your excellent magazine for its editorial, "Technology Isn't Everything", March 1980 issue.

With this type of comment EA is fulfilling its role as a prime mouthpiece of the industry in not only communicating technical information and ideas but also reflecting many of its attitudes and aspirations.

As with all coins, however, there are two sides to the point made by Leo Simpson, though I appreciate fully that it is not the industry's place to decide the Humanities student's at-

ROD IRVING ELECTRONICS

499 HIGH STREET, NORTHCOTE 3070 MELBOURNE, VICTORIA. Ph. (03) 489 8131.

ROD IRVING ELECTRONICS: PRE-STOCKTAKING SALE:

EXTRA SPECIALS

Qty	Item	Price
10	BU208	$2.50
100	BU208 (Till Stocks Last)	$200.00
10	BU126	2.90
10	BDX80	75.00
10	BDX80	75.00
10	BD139	2.50
10	BD140	2.50
10	BC549	1.00
10	BC559	1.50
10	BC547	1.00
10	BC557	1.50
10	BC327	1.50
10	2114 (450 ns)	47.50
10	2708	84.00
10	Red Leds	1.20
100	Red Leds	11.00
10	Green Leds	2.00
10	7447	6.00
10	7490	3.50
10	7400	1.50
10	RL4136	13.00

ALL SHOP PRICES LESS 10%

ALL SHOP PRICES LESS 10%

INCLUDES: TRIO CRO'S, BISHOP GRAPHIC PRODUCTS, A & R TRANSFORMERS, RALMAR PRODUCTS, TEXAS INSTRUMENT CALCULATORS, VERBATIM PRODUCTS, FERGUSON TRANSFORMERS, SCOTCHCAL.

*Does not include special prices advertised in ETI, EA, or ARA magazines.

SPECIALS:

Item	Price
2114 (450 ns)	8 for $38.00
2114 (450 ns)	16 for $75.00
2114 (450 ns)	32 for $149.00
2114 (450 ns)	64 for $293.00
2708 (450 ns)	1-8 for $8.50 ea
2708 (450 ns)	16-32 for $8.35 ea
4116 (200-250 ns)	1-7 $10.00 ea
4116 (200-250 ns)	8-15 $9.85 ea
4116 (200-250 ns)	16-31 $9.68 ea
4116 (2000-250 ns)	32+ $8.62 ea

DIP SWITCHES SPST

P/N	No of Switches	Price
SD3	3	$1.60
SD4	4	1.70
SD5	5	1.90
SD6	6	2.30
SD7	7	2.40
SD8	8	2.50
SD9	9	2.70
SD10	10	3.00

DIP SWITCHES SPST

TEXTOOL ZIP* DIP II SOCKETS

Item	Price
16 Pin Zip* Dip 11	$11.50
24 Pin Zip* Dip 11	12.50
40 Pin Zip* Dip 11	17.50

*Zero Insertion Pressure

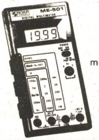
CANNON CONNECTORS

Item	Price
XLP-3-11C	$4.50
XLP-3-12C	4.50
XLP-3-13	4.20
XLP-3-14	3.60
XLP-LNE-31	4.50
XLP-LNE-32	4.60
LP-LNE-12	5.50

RS232 & "D" TYPE CONNECTORS

PART NO	DESCRIPTION	1-9	10-25	25+
DE-9P	9 PIN MALE	$3.50	$3.50	$3.10
DE-9S	9 PIN F/MALE	4.50	4.20	3.90
DE-9C	9 PIN COVER	2.20	2.10	1.90
DA-15P	15 PIN MALE	4.50	4.20	3.90
DA-15S	15 PIN F/MALE	5.10	4.90	4.70
DA-15C	15 PIN COVER	2.30	2.10	2.00
DB-25P	25 PIN MALE	5.90	5.60	5.10
DB-25S	25 PIN F/MALE	6.90	6.60	6.10
DB-25C	1 pc Grey Hood	2.40	2.20	2.00
DB-25C2B	2 pc. Black Hood	2.80	2.70	2.50
DB-25C2G	2 pc. Grey Hood	2.70	2.50	2.40
DC-37P	37 PIN MALE	7.90	7.50	7.10
DC-37S	37 PIN F/MALE	10.90	9.90	9.10
DC-37C	37 PIN COVER	4.90	4.50	4.10
DH/S	Hardware set (2 Pairs)	2.10	1.90	1.80

SOAR corporation



Digital hand multimeter **$77**

COMPUTER GRADE ELECTRO.

Capacitance	Voltage	Price
2900uf	40V	$6.50
6800uf	16V	6.40
10,000uf	16V	9.00
10,000uf	25V	9.50
10,000uf	40V	11.90
15,000uf	40V	12.00
22,000uf	25V	12.90
22,000uf	40V	23.00
27,000uf	35V	23.50
33,000uf	16V	23.50
68,000uf	16V	21.50
100,000uf	10V	20.50

MULTISTRAND RIBBON CABLE

Price Per Meter:

	1-9	10+
10 Way	.70c	.60c
12 Way	.75c	.65c
16 Way	$1.00	.90c
20 Way	$1.35	$1.25
40 Way	$2.70	$2.50

RIE are now distributors for 3M products including Scotchcal range.

Item	Price
8016 blue on white plastic	$4.10
8018 green on white plastic	$4.10
8011 red on white plastic	$4.60
8012 black on transparent plastic	$4.10
8013 black on yellow plastic	$4.10
8015 black on white plastic	$4.10
8009 light blue on aluminium	$4.10
8001 red on aluminium	$4.10
8005 black on aluminium	$4.60
8007 reversing film	$3.75
*Note — all above sheets 10in x 12in	
8500 Photosensitive developer	$4.40
3900 clear coating (glossy finish)	$9.30
3930 clear coating (matte finish)	$9.30
ML-3 Applicator block	$3.90
ML-4 developer pads 10 for:— 8002KA evaluation kit	$8.90

EA METAL DETECTOR

Item	Price
EA 79md 9	$2.60
As A Kit (without H/phones)	19.90
ET576	4.90
Dream 6800	9.90
ETI 472	2.90
ETI 471	9.90
ETI 470	2.75
ETI Series 4000 Kit	179.00
ETI 585 Rx ultrasonic Rx	15.95
ETI 585 Tx ultrasonic Tx	8.95

NEW PROJECT BOARDS

Board	Price	Board	Price
ETI 151	$2.20	ETI 726	$3.30
ETI 152	$2.00	79UPS6	$2.90
ETI 261	$1.50	79TI11	$2.20
ETI 264	$1.50	79SF9	$2.60
ETI 321	$3.90	79PS11	$2.90
ETI 322	$2.75	79se3	$3.90
ETI 452	$5.90	79md9	$2.20
ETI 466	$6.50	80au3	$2.90
ETI 474	$2.20	80cm3A	$2.40
ETI 470	$2.70	80cm3B	$3.50
ETI 471	$9.90	DREAM 6800	$10.90
ETI 472	$2.70		
ETI 541	$2.60	DREAM 6802	$11.90
ETI 549A	$2.50		
ETI 561	$2.75		
ETI 573	$2.90	(Redesigned board with notes to eliminate 6875 clock chip)	
ETI 576	$4.50		
ETI 577	$2.70		
ETI 606	$2.30		

Please note all boards are fibreglass 1oz copper precision drilled.

PROJECT BOARDS (FIBREGLASS)

Board	Price	Board	Price
ETI 043	$1.40	ETI 481M	$2.00
ETI 044	1.30	ETI 481PS	3.50
ETI 047	1.50	ETI 483	2.20
ETI 061	1.40	ETI 484	3.90
ETI 062	1.80	ETI 485	2.90
ETI 063	1.70	ETI 486	2.90
ETI 064	1.70	ETI 489A	2.50
ETI 065	1.70	ETI 499	1.99
ETI 067	1.80	ETI 528	2.20
ETI 068	1.40	ETI 541	2.20
ETI 071	1.40	ETI 547	2.20
ETI 072	1.80	ETI 581	2.20
ETI 081	1.50	ETI 583	2.20
ETI 083	1.80	ETI 585R	1.60
ETI 084	1.70	ETI 585T	1.40
ETI 085	1.30	ETI 586	2.30
ETI 130	1.90	ETI 603	2.50
ETI 134	1.90	ETI 604	1.60
ETI 135	1.90	ETI 635	2.90
ETI 136	1.80	ETI 638A	3.90
ETI 137A	2.90	ETI 708	1.90
ETI 137B	2.90	ETI 713	3.90
ETI 139	1.90	ETI 714	1.90
ETI 245	1.60	ETI 717	2.90
ETI 417	1.80	EA 78AOB	2.90
ETI 445	1.50	EA 78TM8	2.00
ETI 446	1.90	EA 78N6	3.20
ETI 449	1.50	EA 78NG4	2.50
ETI 450A	1.90	EA 78UT4	3.90
ETI 450B	1.90	EA 78T3	4.20
ETI 480	2.40	EA 78C5	3.90
ETI 480PS	2.40		

IC SOCKETS (Low Profile)

	1-9	10-25	100+
8 Pin	.18c	.17c	.16c
14 Pin	.22	.20	.19
16 Pin	.24	.22	.20
18 Pin	.40	.36	.33
20 Pin	.42	.39	.36
22 Pin	.44	.40	.38
24 Pin	.45	.41	.39
28 Pin	.50	.46	.42
40 Pin	.58	.55	.51

All Solder Tail

WIRE WRAP 3-LEVEL

	1-9	10-25	100+
8 Pin	.75c	.65c	.50c
14 Pin	.90c	.85c	.80c
16 Pin	$1.00	.90c	.85c
18 Pin	1.20	$1.10	$1.00
20 Pin	1.40	1.30	1.20
22 Pin	1.60	1.40	1.30
24 Pin	1.90	1.80	1.70
28 Pin	2.20	2.10	2.00
36 Pin	2.60	2.40	2.30
40 Pin	2.90	2.70	2.50

bankcard welcome here

Bankcard Mail Orders Welcome

Please debit my Bankcard.

Bankcard No. ....

Expiry Date ....

Name ....

Signature ....

HEAVIER ITEMS ADD ADDITIONAL POSTAGE. EXTRA HEAVY ITEMS SENT COMET FREIGHT ON. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. SEND 60c & SAE FOR FREE CATALOGUE.

MAIL ORDERS: PO BOX 135, NORTHCOTE, VIC 3070
MIN PACK & POST $1.25

titudes toward technology. I write with this in mind.

In this age of extremely rapid advance and growth of both new technology and its application, combined with the fear I have heard expressed not infrequently concerning the risk that technocrats may end up ruling the world, it has become the thing for society to look to us for answers to many of the social problems being created by new technology, especially in regard to computers and unemployment.

In this context it would be very dangerous for us to encourage our students to take up electives in the humanities without a corresponding and compatible drive by universities, etc, to have humanities students take up similarly basic electives in engineering or other technical courses.

While I applaud loudly our industry in taking the initiative, we must be mindful that the buck is not passed to us and we find ourselves carrying the responsibility for the way the community at large responds to our endeavours.

Historically, the success or otherwise of technical progress has relied to a very large degree on the concensus of society, the attitudes of our politicians and the availability of finance in the money market. We come up with ideas intended primarily to solve human problems and contribute to the advance of civilisation, but we have relatively little say in whether or not those ideas are put into practice.

Further, and very relevent to the discussion, all of us have been through the education system and studied as compulsory subjects, in varying degrees, English, History, Geography, Social Science and others. We all live in society and are exposed continually to its attitudes toward our field and so it would be a very rare engineer who is unaware of the social implications of his work. This point is borne out very well in the fact that we are taking initiatives in this area.

There is a need for us to shed the popular "technology nut" image we have developed for one reason or the other, but let us not forget that we are only a part of society and the burdens resulting from advances in technology must be shared equitably across a broad spectrum of that society.

G. Hardwick,
Member, Australian Mensa,
Gladesville, NSW.

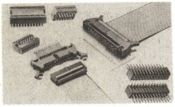
On the merits of programming

I was intrigued to read the two contributions by Mr David Fulcher in the March issue of EA.

Speaking as a very ignorant beginner — the type of person whom Mr Fulcher obviously despises — I would not dare to comment on the merits of his program as compared with that submitted earlier by Mr Reid. But I would suggest that it is one matter to originate an idea and another matter entirely merely to improve on an existing one. No doubt Mr Fulcher would consider the efforts of people like Ohm, Faraday and the Curies "amateurish in the extreme" since any science student today knows far more than they ever did.

His other complaint re poor explanation is interesting in the light of the fact that, in the reaction time program he has submitted, he writes, "It is advisable to operate at 300 baud, and if this modification has not been made to PIPBUG ..." As far as my extremely limited knowledge goes, PIPBUG is a factory programmed read only memory. How does one modify it? With a tin opener and a microscopic soldering iron? He also writes of the address at 55F and then later mentions the section "from 0527 onwards". Surely the address should be 055F, or is there some technical significance designed to confuse the ignorant and keep them in

RADIO DESPATCH SERVICE
869 George St, Sydney 2000
Phone 211 0816, 211 0191



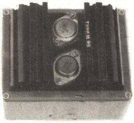
Hirose and Ansley Ribbon Cable Connectors fitted same day.

Texas Instruments Calculators & Accessories

TI.25	Thermal paper
TI30 student pack	battery packs
TI1750	adaptors
TI35	magnetic cards
TI50	libraries
TI55	vowel power
TI58C	super stumpers I
TI59	Coding forms
Little Professor	
Data Man	pakettes

All PC Boards for EA & ETI Projects Front panels for some 1979 and 1980 EA and ETI projects. Black or silver background by the Scotchcal System.

See us for all types of valves.
Distributors for XCELITE TOOLS



E.A. DEC. 79 TRANSISTOR-ASSISTED IGNITION SYSTEM

Complete kits

Drilled Box and heat-sink	$35.00
Undrilled box and heat-sink	$30.00

LOW PRICE TRANSFORMERS HIGH QUALITY

R2150 $2.95 (2851)

Primary	240V AC
Secondary voltage	12.8V CT
Secondary current	150MA
Termination	flying leads

R2155 $4.75

Primary	240V AC
Tapped secondary voltages	6.3, 7.5, 8.5, 9.5, 12.6, 15 volts
Secondary current	1 amp
Termination	solder lugs

R6678 $7.25

Primary	240V AC
Tapped secondary voltages	15, 17.5, 20, 24, 27.5, 30 volts
Secondary current	1 amp
Termination	solder lugs

MAIL ORDER CUSTOMERS
$1.00 packing plus 5 per cent of order value up to $80.00, thence a flat $4.00 for postal items. Carrier — freight on.

OPEN: Mon-Fri 8am to 5.30pm. Thursday night late shopping till 8.30pm. Saturday 8am to 11.45am.

their place?

I can't help feeling that if Mr Fulcher's manners were only equal to his technical knowlege he would be a most admirable gentleman indeed.

R. Hartkopf, VK3AOH, Alphington, Vic.

Suitable microphones for the Graphic Analyser

I was disappointed to read in your Graphic Analyser article (Feb 80) the term "connect a microphone" as I believe this is evading an important issue.

The analyser will certainly help to achieve a flat response at its input terminal, but if the microphone is not flat, then nothing much seems to have been achieved.

Since my interest in the analyser is in removing peaks from a PA system, with the microphones being the prime suspects, I believe that analysers using just any microphone would be a waste of time.

This matter, I believe, requires more attention especially since the same issue carried an article on AKG microphones in which it was stated that "a microphone" is not flat.

Alan Mallory, Noble Park, Vic.

COMMENT: A good quality electret microphone in the $30-40 price range, though not ideal, would be a step in the right direction in helping to flatten the reponse of a typical listening room.

Inductive ignition cable

I am writing as a result of an article in the February issue of your magazine on inductive ignition cable.

In the article you mentioned that a source of the product in Australia was hard to locate.

I believe that his cable has been available in Australia for several years under the title "Holley TC" cable.

I have a copy of a Dunlop publication (about 1976 vintage I think) entitled "Engineering Guide and Reference Book for IBC-ESCA". On page M1833 they have an advert for the abovementioned cable.

While the cable is not specified as being "inductive", it certainly does have all the characteristics mentioned in your article, including a DC resistance of 1500-2300 ohms per metre, a glass rope core surrounded by a magnetic layer to suppress interference, and a monel conductor wound around the magnetic layer.

I would suggest that persons interested in trying out this inductive cable could probably obtain it through Dunlop-IBC-ESCA or possibly through other distributors (pardon the pun) of Holley products.

A. Richardson, Telopea Downs, Vic.

Alien intelligence

Your article on SETI (EA, March) should have posed yet another question.

For a very long time, astronomers have reported seeing lights and dust (or vapour) clouds on our own moon.

Now that NASA has a host of photos (and astronaut reports) of inexplicable details on the lunar surface, we should be asking whose moon it is.

The Apollo 14 crew photographed a massive object on a terrace in an un-named crater. The photo (NASA number: 71-H-781) also shows a track leading into the crater and up to the object (code-named "Annbell").

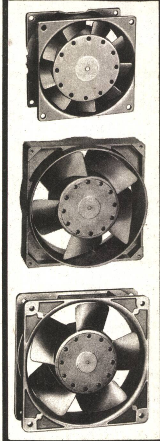
Ken Mattingly (Apollo 16) radioed: "Another strange sight over here. It looks — a flashing light — think it's Annbell".

A photo of Vitello Crater (67-H-1135) shows two huge, track-making objects. After 13 years, NASA has yet to explain how one object moved upwards, out of the crater, and on to the surrounding plain.

With lights, intensely brilliant flashes, clouds, tracks and massive, mobile objects on that allegedly dead world, who needs to eavesdrop on the rest of the galaxy?

G. Lindley, Redfern, NSW.

PRECISION FANS



ebm

THE SUPER GROUP

Range of application:
Fans for cooling, ventilation and deaeration of electrical and electronic units and systems as:

electronic data processing system with all external units needed for this system, automatic booking machines, business machines, measuring instruments, appliances of the wireless engineering, photo copying equipment, acoustic instruments, high frequency generators, clean air cabines, lift cages, welding equipment, motors and generators (additional ventilation).

INSTANT COMPONENT SERVICE

marketing division of **STC-CANNON** **COMPONENTS PTY LTD**

248 Wickham Rd, Moorabbin, Victoria, 3189

ADELAIDE: 268 7088 BRISBANE: 44 6667
MELBOURNE: 95 9566 SYDNEY: 597 1444

REVIEWS OF RECENT

Records & Tapes

CLASSICAL ● POPULAR ● SPECIAL INTEREST

Tchaikovsky 4th: "Unlikely to be surpassed"

TCHAIKOVSKY — Symphony No. 4 in F Minor. Berlin Philharmonic Orchestra conducted by Herbert von Karajan. DGG Stereo Disc 2530 883.

If you're looking for a really top quality Tchaikovsky Fourth, here is one unlikely to be surpassed for a long time. I know of no better, and that includes Abbado's superb performance with the Vienna Philharmonic.

DGG's sound is magnificent, clean and open, unspoiled by excessive reverberation, even after a quickly cut off fortissimo chord. Karajan conjures up just the right amount of excitement but without the Bernstein school's tendency to hysteria. The Berliners' playing is beyond praise and the conductor's control evident in every bar. He manages to keep the first theme in the first movement unlike a waltz, as it so often sounds under other conductors.

The oboe theme in the second movement is quite without sentimentality, yet never cold. The movement becomes quite jovial when the lurching theme of the "trio" is reached. The supreme accuracy of the third movement is established in the first few pizzicato bars. Here you are in fairyland.

In the Finale Karajan breezes along at as fast a tempo as is possible, without appearing to push the players too hard. And they themselves seem to be loving it. In short, unless you're one of the condescending — and tasteless — young contemporaries who claim to despise Tchaikovsky, this is certainly for you. (J.R.)

Peter Tschaikowsky · Symphonie Nr. 4
Berliner Philharmoniker · Herbert von Karajan

Rachmaninov: Suites for two pianos

RACHMANINOV — Suites for Two Pianos each consisting of four short pieces for piano duo. Players are John Ogdon and Brenda Lewis. World Record Club Stereo Disc E 04458.

I would guess that only a few people have ever heard of these two suites, yet they are surprisingly attractive and sure to appeal to any Rachmaninov admirer.

The first suite, an early work numbered Opus 5, has the subtitle Tableaux. The second is simply labelled Opus 17.

It is obvious that the early suite, despite its provenance, is the work of an artist who has already mastered the technique of his medium. Of its four pieces, the first is a barcarolle but a very unusual one. There is no rocking motion or strict 6/8 rhythm. Instead, it is almost rhapsodic and to me expresses the emotion one might feel at one's first ride in a gondola. No. 2, Night . . . Love is permeated by bird-like twitterings. Later Love, not unexpectedly, becomes emotionally richer but subsides gracefully as the twittering returns.

I might mention here that, all through this recital, the rapport between the players is never less than perfect and, to those who are not already aware of the fact, they are a husband and wife team. But, despite the suite's attractiveness, don't expect to find the maturity of the later piano concertos.

Number 3, Tears, is a short piece which builds up to a climax almost of torment. No. 4 Easter offers a bell-like clanging of the two pianos reminscent of the Coronation Scene in Moussorgsky's Boris Godunov.

Opus 17 was composed some 20 years later but, although basically similar to its predecessor, has been set down from a much greater technical resource. The harmonic scheme is more like that of the concertos. It starts with a march of no great moment and goes on to a second item described as a waltz but marked "presto" which, to say nothing more, is unusual. The third item, a Romance, is a Chopinesque fragment of no great interest and the concluding Tarentella is a brisk 6/8 dance that demands — and receives all the great technical resources of both players.

I wouldn't say that Rachmaninov's best ideas are evident in either of the suites but they are both ingratiating and well worthwhile listening to, from time to time. (J.R.)

☆ ☆ ☆

DEBUSSY — Preludes, Vol 1. Pianist Arturo Michelangeli. DGG Stereo Disc 2531200.

This unpredictable pianist has produced the best Debussy piano recital I have heard since Gieseking's some 25 years ago. By the way, it is not Michelangeli's playing that is unpredictable — though to everything he plays he usually adds some original, unexpected but always beautiful feature — but because of his habit of not turning up at concerts and recording sessions for which he has been engaged!

Gieseking's Debussy was a beautiful example of pianism at its most

---

Reviews in this section are by Julian Russell (J.R.), Paul Frolich (P.F.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), and Danny Hooper (D.H.).

sensitive; touch, tempo and phrasing were always irreproachable. They are here, too, in this disc of Michelangeli but he adds an indefinable something to Gieseking's readings. He manages somehow to enlarge one's understanding of Debussy's music, no matter how much you thought you knew about it before!

Without impairing what is too often called Debussy's "impressionism", Michelangeli often presents an atmosphere that can only be described as "realistic". For instance, his Danseuses de Delph, despite its slightly slower tempo than usual, is not only a real dance but seems to come from the far distant past. In it, Michelangeli uses suprisingly little pedal. In Voiles, on the other hand, he uses the sustaining pedal freely so that each bar seems to hang visibly in the air. In Le Vent dans la Plaine, Michelangeli's plain is treeless, a tireless wind blowing across it at varying intensities from breeze to something to make you hold your hat on!

I could make similar remarks about almost every item on this fascinating disc but space limits forbid it. I can only recommend it with the greatest enthusiasm and look forward eagerly to hearing his recording of the Second Book of Preludes, which is already on sale. (J.R.)

☆ ☆ ☆

SCHUMANN — Symphony No. 1 (Spring) in B Flat Major and Symphony No. 4 in D Minor played by the Chicago Symphony Orchestra conducted by Daniel Barenboim. DGG Stereo Cassette 3300 660.
— Symphony No. 2 in C Major. Koncertstuck for Four Horns and Orchestra. Played by the same artists. DGG Stereo Cassette 3300 939.
— Symphony No. 3 (Rhenische) in E Flat Major. Manfred Overture. Same artists as above. DGG Stereo cassette 3300 940.

Barenboim has the knack of making Schumann's often criticised orchestration sound better than it really is. A slightly inflected instrument or orchestral section here and some dynamic restraint elsewhere clears up much of the "muddiness" of the original sound. Listeners must have noticed how different a Brahms symphony can be made to sound if treated the same way, although in that case on an entirely different scale.

Barenboim also has the talent to preserve everywhere Schumann's unique impulsiveness, although cynics might say that all these features can be obtained by discreet monitoring. In this case I think not, unless at least carried out under the supervision of the conductor.

Another improvement in the presentation of these cassettes is the extension of the range of annotations. Till now the very scanty information that accompanied the average cassette was limited to what could be fitted on to the back of the cardboard wrap. In this series, the cardboard now contains a small booklet in which can be found most of the necessary information about the music — of great assistance to those to whom the contents are unfamiliar.

During the performance of these symphonies there are, of course, many sections that can be played and made to sound beautiful exactly as the composer wrote them and these Barenboim treats with the respect they deserve. Take, as an example, the great Larghetto of the Spring Symphony (No. 1) and listen to his treatment of the cello theme against pizzicato violins and alternating woodwind passages. Again the question of space prevents me from doing full justice to the many splendid features and very rare blots on these vital performances. But in this I am being helped by the fact that Barenboim is a born Schumann conductor who has the nowadays great Chicago Symphony Orchestra to work with.

In addition to the three symphonies you will also find the Manfred Overture and Konzertstuck for Four Horns as make weights. Recommended. (J.R.)

A NOSTALGIC JOURNEY

— with Reader's Digest

THE GOLDEN AGE OF ENTERTAINMENT. Collector's Edition. Eight-record boxed set or six-cassette set. From Reader's Digest.

For those who are even slightly grey at the temples, merely to read through the contents of this set is like a trip down memory lane. There are often-played numbers like Al Jolson's "Swanee", Judy Garland's "Rainbow", Duke Ellington's "A Train", The Mills Brothers, "Paper Doll", Alan Jones' "Donkey Serenade" and Fred Waring's "Smoke Gets In Your Eyes".

But then you'll be reminded of Durante's "You Gotta Start Each Day With A Song", and Fats Waller's delightful send-up of "It's A Sin To Tell A Lie". In fact, there's a whole array of singers and orchestras on the 90-odd tracks.

The sides are divided into: Great Entertainers — Great Male Vocalists — Stardust Ballroom/Sweet Bands (I'll forget the "great" to save space) — Music Makers/Swing Bands — Female Vocalists — Sweet Harmony/Golden Groups — Rhythm Singers — Toast Of Broadway — Hollywood Cavalcade — Golden Age of Radio — Jukebox Jamboree — Hear Them Again/ Golden Voices — Songs of Berlin, Kern Gershwin, etc.

For "collectors items" of the various periods, the "stereo" endorsement has to be a semi-fiction; a lot of the tracks are re-processed mono. One thing is apparent, however: those who produced the American master tapes have managed to balance the tracks into a uniform medium-fi quality, so that the listening mood is not jolted either by exhilarating wide range or sound of the dull, noisy '78 variety. At least, that's the way it was in the tracks I sampled.

In short: a long, leisurely journey down memory lane, with ample notes to read, while you listen.

Reader's Digest cash price for the record set is $39.99 plus $1.75 pack and post; for the cassettes $39.99 plus $1.16. But, perhaps typical of R.D., they make things easy: just place your order, if you like, and say whether you want to pay by cash or instalments! Reader's Digest are at 26-32 Waterloo St, Surry Hills, NSW 2010. Phone (02) 699 0111. Reference: Jandura Fajardo. (W.N.W.)

RECITAL of songs by Duparc and Chausson sung by mezzo-soprano Janet Baker with Andre Previn conducting the London Symphony Orchestra. World Record Club quadraphonic (compatible stereo disc) WRC R05532.

A recital by Janet Baker is always welcome but I was somewhat disappointed in this one. Her program is devoted entirely to French songs and, although I remember having read somewhere that Ms Baker did much of her training in France, her French diction here is often slightly slurred and often without point. Even to someone reasonably acquainted with the language she is, at times, difficult to understand. Moreover her voice is a little too heavy and the quality too dark in many of her items. In a delicious song like Duparc's Invitation to the Voyage I prefer the way Jessie Norman floats out her opening notes to Janet Baker's more weighty delivery. Also the exquisitely written piano accompaniment loses much when transferred, as it is here, and the opening bars become just a murmur in the strings.

The same qualified praise could apply to the rest of her recital, where there is never a jarring note and fine

Hands up if you own a graphic equaliser. . .

Hands up if you know how to *use* it . . .

It's a fact: thousands of people have bought or built graphic equalisers recently, but only a tiny percentage have any idea how to use them.

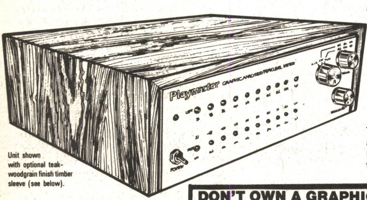
Sure, it's fun to listen to the sound change its character as you play with the knobs – but after that, what?

Those 'in the know' have known about a device which would allow you to get the most from your graphic equaliser.

This device, called a 'Graphic Analyser', allows you to obtain a virtually 'flat' frequency response from your audio system – which is what hi fi is all about, isn't it?

Trouble was, graphic analysers weren't all that common. That was, until March Electronics Australia magazine described a particularly good graphic analyser: ideal for the hobbyist to build, and at low cost!

Here it is: the new Playmaster Graphic Analyser kit from Dick Smith Electronics



Unit shown with optional teak-woodgrain finish timber sleeve (see below).

You win three ways with this superb new Graphic Analyser from Dick Smith:

1: It is **more** than just a graphic analyser. After you've set your equaliser levels, it doubles as a peak level meter, reading the level from each stereo channel and displaying it via LED indicators.

2: It is priced under $100.00! It's this low, low price because it is supplied as a kit: **you** supply the labour to put it together (a very easy task) and save hundreds of dollars by doing so!.

3: It comes complete with full instructions, both how to put it together, and how to get the most from your system. When it's finished, you'll be proud to say 'I built it!'.

The Playmaster Graphic Analyser/Level Meter was designed to match any graphic equaliser – not just its partner, the Playmaster Graphic Equaliser. So even if you bought your equaliser 'off the shelf', have no fear: this analyser will still help you!.

Playmaster Graphic Analyser/Level Meter

$99.50

Cat K-3510

Simulated Walnut Sleeve, as above:

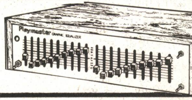
Cat H-3113 **$8.50**

DON'T OWN A GRAPHIC EQUALISER EITHER?

Why not build **both**! The Graphic Analyser **and** the Graphic Equaliser. They're a great pair: perfectly matched to each other. You'll really get the most from your hi fi system Imagine – being able to contour the frequency response to the way **you** want it!

$99.50

Cat K-3500



DICK SMITH ELECTRONICS

NSW
125 York Street, SYDNEY. Ph 290 3377
147 Hume Highway, CHULLORA. Ph 642 8922
162 Pacific Highway, GORE HILL. Ph 439 5311
30 Grose Street, PARRAMATTA Ph 683 1133
396 Lane Cove Rd, NORTH RYDE Ph 888 3200
263 Keira Street, WOLLONGONG. Ph 28 3800
613 Princes Highway, BLAKEHURST (Opening Soon)

VIC
399 Lonsdale Street, MELBOURNE. Ph 67 9834
656 Bridge Road, RICHMOND. Ph 428 1614

QLD
166 Logan Road, BURANDA. Ph 391 6233
842 Gympie Road, CHERMSIDE. Ph 59 6970

ACT 96 Gladstone Street, FYSHWICK. Ph 80 4944

SA 60 Wright Street, ADELAIDE. Ph 212 1962

WA 414 William Street, PERTH. Ph 328 6944

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113. Ph 888 3200. PACK & POST EXTRA.

bankcard
welcome here

SHOPS OPEN 9AM to 5.30PM
(Saturday: 9am till 12 noon)
BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY
RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

RECORDS & TAPES — continued

drama can always be found in the climaxes. Thus her Phydyle has just the right atmosphere of a sleepy Mediterranean afternoon.

But I think the most successful of her Duparc group is Le Manoir de Rosamonde, perhaps because of its strong reliance on the influence of German lieder with hints of a distant Schumann's Dichterlieber and, nearer home, Franck's Chasseur Maudit.

The second side is given to Chausson's Poem of Love and the Sea whose three songs really form a kind of scene in which Ms Baker's fine sense of drama comes into its own, built over a thrilling climax by Previn and his orchestra. Previn is assertive throughout when necessary and self-effacing when occasion demands. The opulent scoring gives the LSO a chance to show its many great merits.

The Suite is good to have, since it is nowadays so seldom heard in the concert hall — except in France. Indeed the whole disc has many good points; as to the diction, if you play a side of Debussy's Pelleas sung by a French cast it might help to make my meaning clearer. (J.R.)

☆ ☆ ☆

SCHUBERT: Mass in E flat. Felicity Palmer, soprano; Helen Watts, contralto; Kenneth Bowen & Wynford Evans, tenors; Christopher Keyte, bass. The Choir of St John's College, Cambridge; the Academy of St Martin-in-the-Fields; directed by George Guest. World Record stereo disc R 06054 (605 Camberwell Rd, Hartwell, 3124).

Taken from an Argo recording first issued in 1975, this is a wonderful tribute to Schubert and one of the finest examples of the great Cambridge tradition in performing liturgical music. Schubert, as we know, was not very religious; Catholicism in Austria was easy-going anyhow and a former boy-chorister tended to take much for granted! However, of all his Masses the E flat, written during the last year of his life, is probably the most genuinely felt and the most moving one.

This Mass contains a lot of glorious music, much of it very typical of Schubert in its development; singers and instrumentalists alike are heard in top-form and they are aided by an exemplary recording and good sound. The real hero of the occasion is, I suspect, director George Guest; a fine musician and, as his past suggests, a devout believer, he imbues Schubert's often secular ideas with a depth of feeling such as has rarely been heard in scores of this nature. The recording is aided by Alan Blyth's notes which are also tailored to make the work liturgically credible. For Schubert and church music at their best: this is the disc! (P.F.)

BRUNO WALTER CONDUCTS: SCHUMANN: Symphony No. 3 in E flat, op.97, "Rhenish"; BRAHMS: Academic Festival Overture, op.80; Variations on a Theme by Haydn, op.56a. New York Philharmonic Orchestra, conducted by Bruno Walter. CBA Odyssey ODA 5141 (monophonic disc).

The performances on this disc were recorded in 1941 when Bruno Walter, in his mid-sixties, was at the height of his powers, adored by his orchestra and recognised as the greatest living authority on German romantic music as well as on that of Mozart. Many present-day scholars are ready to challenge Walter's style in Mozart, but few would argue with his interpretation of the great romantic works; after all,

That Technicolour Dreamcoat . . .

JOSEPH AND THE AMAZING TECHNICOLOUR DREAMCOAT. Stereo, Move MS-3010. Also available on cassette. (From Move Records, Box 266, Carlton South, Vic 3053).

Written some 10 years ago by Andrew Lloyd Webber (music) and Tim Rice (lyrics) Joseph and the Amazing Technicolour Dreamcoat showed the way for the same writers' smash-hit success "Jesus Christ, Superstar". "Joseph" is on a smaller scale but, even so, Gramophone magazine welcomed it in 1973 as "one of the freshest and liveliest scores of the decade".

Recorded in Vancouver, Canada, this Move release has Rob Gillespie recounting the familiar old testament story in song, assuming the various character roles and backed by orchestra and chorus. It should be welcomed by those groups who may aspire to produce their own version.

The novel jacket cover is illustrated by cartoon-like drawings, each relating to one of the vocal themes: Joseph's Dreams — Poor, Poor Joseph — Joseph In Egypt — Close Every Door To Me — Joseph In Prison — Pharaoh's Dream — Pharaoh's Number Two — Famine — Who's The Thief? — Any Dream Will Do. Diction and general sound quality are both good.

Move Records indicate that a lyrics sheet is available on request (with stamped, addressed envelope) while a poster version of the jacket is available for $2.95. (W.N.W.)

Gospel in song

THE LORD'S SUPPER by John Michael Talbot, with choir and orchestra. Stereo, Birdwing BWR-2013. (From Spotlight Music Pty Ltd, 262 Pitt St, Sydney 2000).

A most interesting record, this. John Talbot was co-leader and co-songwriter of the "Mason Profitt" band up till 1972, when he became a practicing christian. Deeply challenged about social problems and the ministry of Christian music, he has become "a modern troubadour" bridging traditional beliefs with modern musical expression. And so to this new album, in which his compositions and arrangements are modern but the words are almost straight from ancient church liturgy: We Shall Stand Forgiven — Glory To God — Creed — Holy, Holy, Holy — Lord's Prayer — Communion Song — Lamb Of God.

While John Talbot is a true professional, the notes suggest that many of the others who provided the backing are ordinary local-church christians from Indianapolis, with no professional experience whatever. But there is nothing amateurish about the music, a mix of orchestral, instrumental, and devotional choral, with John Talbot on lead guitar and vocals.

Over-dubbing, mixing and reverb combine to produce a fullsome sound of pleasant quality. As I said: interesting. (W.N.W.)

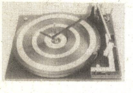
☆ ☆ ☆

SWEET COMFORT BAND. Breakin' The Ice. LIGHT LS 5751 Lexicon Music. (From Word Records Australia, 18-26 Canterbury Rd, Heathmont, Vic 3135).

Nine fairly long tracks in a rocking style with a touch of disco would be the best description of this album from "Light". The sleeve carries the lyrics but the diction of the four musicians leaves no doubt as to the meaning of the words.

The tracks are: Got To Believe — Breakin' The Ice — Young Girl — Melody — I Need Your Love Again — Good Feelin' — Searchin' For Love — The Lord Is Calling — I Love You With My Life. The technical quality is excellent, with a good stereo image; well worth a listen if you appreciate rock/disco Gospel. (NJM)

SPECIAL PURCHASES



NEW STANDARD B.S.R. RECORD CHANGERS

$39.00

Fully automatic turntable plays up to six records automatically and single records automatically or manually as required. 11" turntable. Cue & pause control. Record speeds 331/3, 45 and 78 rev./min. Finished in black with silver trim. Player and changer spindles supplied. Fitted with ceramic cartridge. Post & packing extra. NSW $2.70; Vic., Qld, SA $3.70; WA $4.70 (registered post $2 extra if required).

Spare cartridge and stylus for above $3.50 (list price $10.00).

SPEAKER GRILLE FABRIC AT ½ PRICE

AVAILABLE IN LIGHT & MID BROWNS. WIDTH 54"

$4.80 Per YARD. Post & Pack $1.75.

Send two 20c stamps for samples.

GARRARD CC10A RECORD CHANGER

$17.75

Fitted with a Sonatone Garrard Ceramic Cartridge Sapphire Stylus supplied with template & instructions. Posts & Packing: NSW $2.50. Inter. $3.50.

NEW CAR CASSETTE CONVERTERS BICOH MODEL NA100/CC-007A AT APPROX ½ LIST PRICE

By connecting this model with your existing AM car radio, you can enjoy the music of any cassette that has been pre-recorded.
Connection requires no alteration to the car radio. Plug your car aerial into the cassette recorder and using the patch cord supplied, connect the recorder to the aerial connection of your car radio. By following the instructions, installation is a **simple procedure. All cords & brackets are supplied. Can be used in any car with a 12-volt neg. earth** system can also be used with any AM radio by using a 12V supply.

Dimensions: 150 x 110 x 53mm.

(SEE REVIEW EA FEB 1980)

$18.50
post & pack
$2.50 extra

NEW HOKUTONE 12" HI-FI SPEAKERS

Model 300F W09YL 12" power rating 20 watts, 8OHM IMP cone resence 30 cycles. Manufactured by Hokutone Onkyo Co Japan

$12.50 *POST & PACK $2.50*

NEW RANK-ARENA F.M.-A.M. TUNER AMPLIFIER

MODEL RA402. Output 24 watts RMS. (12+12). Response 50HZ to 50KHZ. Mag or ceramic inputs. High & low filters. Loudness control. Provision for 4 speakers.

Freight Extra.

$147.00

NEW AWA HI-FI SPEAKER KITS 8" 2 WAY 3 SPEAKER SYSTEMS AT LESS THAN ½ LIST PRICE

POWER RATING 20 WATTS R.M.S.
IMPEDANCE 8 OHMS
FREQUENCY RANGE 46 TO 18000 CYCLES

Supplied in kit form (less cabinet) each kit comprises: One AWA 8WAC 8in. bass unit, two AWA 4MBC 4in tweeters with ceramic magnets & curve-linear cones, crossover components, grille cloth, innabond lining and cabinet plans.

CABINETS AVAILABLE
Post & packing extra, NSW $2.50, Interstate $3.50.

$18.50 Per Kit

NEW E.M.I. AND HITACHI RECORDING TAPE AT BARGAIN PRICES

HI-DYNAMIC EMITAPE — HIGH OUTPUT — LOW NOISE — HI-FIDELITY

HLP18 7" reel 1800ft. long play $5.95 P & P $1.00
HDP12 5" reel 1200ft. double play $2.95
NEW E.M.I. SUPE C90 CASSETTES, 5 FOR $10.00. *P&P $1.00*
NEW EMI HI-FI C90 CASSETTES 5 for $12.50.
Hitachi LN 8-track 90 minute cartridge. 5 for $10. *P & pack $1.50.*

NEW GOODMAN-FOSTER 3-WAY 4-SPEAKER HI-FI SYSTEM

$39.00 PER KIT

Frequency Range 45 to 22,000 cycles. Power rating 25 watts. RMS Imp-8ohms. Supplied in kit form (less cabinet) each kit comprises two English Goodman 8" bass units. Foster 5" mid range. Foster 1" dome tweeter crossover components Ocodensers and inductance innabond, speaker fabric and plans of cabinet. Cabinet dimensions 23" x 13" x 10". **CABINETS AVAILABLE.**

Post & packing extra: NSW $2.70; VIC, SA, QLD, $4.70; WA $5.70. (REGISTERED POST $2.00 EXTRA IF REQUIRED) cabinets available.

NEW HOKUTONE HI-FI SPEAKER KITS AT A FRACTION OF LIST PRICE

NEW THREE WAY HIGH FIDELITY SPEAKER SYSTEM WITH A FREQUENCY RANGE OF 35 TO 20,000 CYCLES. POWER RATING 50 WATTS.

Supplied in Kit form (less cabinet) Woofer HFW-302, 12". Mid range HM-24 dome. Tweeter HT-60 dome. Three way crossover with separate controls for mid range & tweeter. Innabond lining, grill fabric & cabinet plans supplied Cabinet dimensions 668 high, 435 wide, 310 deep.

$69.00 per kit

Freight extra by rail, air or road transport.

RANK-ARENA 2 WAY SPEAKER

$42.00
PER PAIR

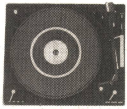
- 10 Watts RMS
- 8 ohm impedance
- 8" woofer with tweeter
- Supplied with lead and plug
- Teak finish

Dimensions 18"H, 11"W, 9½"D
Freight extra per rail air or road transport

TWO WAY SPEAKERS WITH SPECIFICATIONS AS ABOVE WITH WALNUT FINISH

$42.00 PER PAIR

NEW GLENBURN AT100 RECORD PLAYERS



This Glenburn AT100 changer is being sold as a player with short spindle only as changer spindles are not available.

Fully automatic turntable automatically or manually as required. 10" turntable. Cue & pause control. Record speeds 33 1/3, 45 and 78 rev/min. Finished in black with silver trim. Fitted with ceramic cartridge. Post & packaging extra. NSW $2.70; Vic, Qld; SA $3.70; WA $4.70 (registered post $2 extra if required). Same cabinet cut-out as B.S.R.

$24.00

COMMAND BOOK SHELF SPEAKERS.

$30.00
PER PAIR
Freight extra

- 7 watts rms
- 6" twin cone speaker
- Supplied with lead & plug
- Teak finish

Dimensions 15" H, 10" wide, 7" deep.

CLASSIC RADIO

245 PARRAMATTA RD, HABERFIELD 2045. PHONES 798-7145, 798-6507.

Walter and Klemperer were really our last direct links to Mahler and to those who had direct experience of such as Brahms and Liszt.

It would be foolish indeed to expect sound and definition of 1980-standard on so old a recording; as long as we make minor allowances in this regard, there is certainly a great deal to be enjoyed here — to be remembered by us oldies, of undoubted interest to musicians and music-lovers of later vintages.

Walter approached every score, every time, with the utmost respect and humility; he never imposed his own personality on the music to be performed, ever sought for the composer's wishes, however hard they may sometimes be to discover.

The results, as this disc evidences, were well worth the immense trouble he took and the often agonising efforts he demanded from this players.

By today's standards, the performances of the Brahms works are, I think, curiously brisk; the Academic Festival in particular takes on a feeling of gaiety I have not heard for many a year. Of the Variations there are, of course, numerous fine versions, ranging from Furtwangler to Karajan and Haitink, but none of them basically superior to Walter's. The "Rhenish" symphony is played with a wonderful sense of dignity and of a grand occasion — very much to my liking. The orchestra was a splendid ensemble in Walter's hands and the disc is a worthy reminder of those days. (P.F.)

THE BEST OF STANLEY HOLLOWAY. Mono, World Record Club WRC-R 06197.

As a much younger man, testing and servicing radios in a radio factory, I was often guilty of dithering (and listening) when one of Stanley Holloway's monologues came up on air. Some of them I knew almost by heart.

They're all on this one disc — the various adventures of Albert ('oo was eat by a lion), Sam (the marksman, etc) the beefeaters, and others. But, in this collection of 17 monologues, there are others I had forgotten about.

The one notable omission is Stanley Holloway's song "With 'er 'ead toocked underneath 'er arm!"

Considering that most, if not all, come from 78rpm originals, the quality of this re-cut is excellent. If you remember the era that I'm talking about, you'll enjoy this W.R.C. release. (W.N.W.)

☆ ☆ ☆

THE GOLDEN AGE OF WIND MUSIC. Baroque Sonatas and Partitas for Brass and Woodwind Ensembles. Various Ensembles from Germany. Wilhelm Ehmann, conductor. Vanguard stereo VCS10046. Manufactured by Astor Records Pty Ltd.

Nine obscure composers from the 16th, 17th and 18th centuries are featured on this disc. Their music is variable, sometimes light and cheerful while at other times quite dreary. Even so, the record is quite interesting to listen to and worth adding to any collection of classical music. Recording quality is good.

NEW DIGITAL TCHAIKOVSKY 4th

TCHAIKOVSKY, SYMPHONY No. 4. Lorin Maazel and the Cleveland Orchestra. Digital master stereo, Telarc 10047. (From P.C. Stereo, PO Box 272, Mt Gravatt, Qld 4122).

To judge by the reviews, there seems to have been a spate of Tchaikovsky No. 4 recordings in recent months; most of them commended for their technical quality, but each one bearing the subtle stamp of a particular conductor and/or orchestra.

It would take more than the time and resources available to this reviewer to proceed to direct comparisons. It is sufficient to say that this performance sounded fine to me in its own right and well worth the attention of any audiophile who is trying to build up a collection of digitally mastered or direct cut discs.

The first movement occupies the whole of side 1 (17 mins 4 secs) and it characterised by wide dynamic range, as will be evident from a mere examination of the grooves. But it is the three remaining movements on side 2 (aggregating 24 mins 22 secs) that most impress on this respect — from the faintest whisp of pizzicato violin to the full finale theme, sufficient to test any hifi system.

There are generous notes in the double fold jacket covering the composer and his music, the conductor and his orchestra and the digital mastering process.

Mastered by JVC and pressed in Germany, the disc imposes no significant compromise by way of noise or distortion. If you want to add a Tchaikovsky symphony to your "special technology" collection, here is your chance. (W.N.W.)

RADIO PARTS Group

TECHNICAL SEMICONDUCTOR CATALOGUE

AVAILABLE NOW AT

$2.95

INCLUDES FREE DELIVERY (within Victoria)

Add $1 for delivery elsewhere.

THIS PUBLICATION IS THE MOST COMPREHENSIVE GUIDE TO SEMICONDUCTOR PRODUCTS AVAILABLE IN AUSTRALIA.

It contains specifications, technical drawings, circuit details and application notes on the widest range of semiconductor devices stocked in Australia. Over 2500 devices are listed and described with a quick reference indexing system of fast, easy product referral.

SECTION ONE — DIODES
SECTION TWO — TRANSISTORS
SECTION THREE — OPTO ELECTRONICS
SECTION FOUR — LINEAR
SECTION FIVE — DIGITAL
SECTION SIX — CMOS
SECTION SEVEN — MOS/LSI
SECTION EIGHT — INTERFACE
SECTION NINE — MEMORY
SECTION TEN — MICROCOMPUTERS

Post to: "RADIO PARTS GROUP"

562 Spencer St, West Melbourne (03) 329 7888
1103 Dandenong Road, East Malvern (03) 211 8122

Please send me (Qty) .... copies of your new semiconductor catalogue

I am enclosing cheque ....
or please debit my
Bankcard number ....

Signature ....
Name ....
Address ....

BILL EDGE'S ELECTRONIC AGENCIES

115-117 PARRAMATTA ROAD,
CONCORD 2137. NEW PHONE
NO. 2 LINES. TEL: 745 3077
(Corner Lloyd George Ave. and Parramatta Rd., Concord)

MON—FRI (9am — 5.30pm), SAT (9am — NOON)
OPEN SUNDAYS (10am — 2pm).

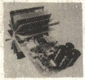
USE YOUR TV AS A LARGE SCREEN OSCILLOSCOPE with this simple TV CRO ADAPTOR (see EA May '80) — complete kit including front panel, hardware and power adaptor **ONLY $39.90**

NEW KITS NOW AVAILABLE

TRANSISTOR-ASSISTED IGNITION (see EA Dec '79) — complete kit ... right down to last nut & bolt — (with diecast box also) ... **ONLY $32.50**

150 WATT VALVE AMP (see ETI May '80) **ONLY $195** *(complete kit with exception of expanded aluminium cover)*

300 WATT "BRUTE" amp
(See ETI Feb 80) only
$63.50



"THE BRUTE" develops 300 watts into 4 ohms, 200 watts into 8 ohms.
COMPLETE KIT FOR ETI 466 300 WATT AMPLIFIER MODULE (less heatsink and power transformer), exactly as described by ETI, including heatsink bracket, all nuts, bolts, silicon grease, etc. **ONLY $63.50**
HEATSINK FOR ETI 466 AMP. This can be done in two ways as mentioned by ETI, ie, you can make your own out of aluminium (which is not as easy as it looks and is very critical), or you can buy the **PHILIPS 65D6C HEATSINK for $27.50.** (NB. This is the only commercial heatsink available in Australia that is recommended.)
FAN is also available if required for **$29.50.**
TRANSFORMER to suit ETI 466 amplifier, **$32.50.**
All parts for ETI 466 are available separately: ETI 466 Printed Board $7.00; MJ15003 $5.00, MJ15004 $5.00.
CASE FOR AMP. We have three cases suitable for the ETI 466 (all unpunched): ETI 4000 Amp case (rack mounted) $55.00; ETI 4000 Amp Case (wooden sided) $45.00; Dick Smith Rack Mount $49.00
OTHER KITS IN OUR RANGE INCLUDE: ● ETI 4000 Amplifier (see ETI May, June, July '79) only $179.00 with wooden sided case, $189.00 with rack mounting case. $10.00 extra with 'C' core transformer ● 60 Watt Low Distortion Amplifier Module ETI 470 $29.90. ● ETI 471 Pre-amp Control Unit $49.90. ● ETI 472 Power Supply Kit $42.90, with 'C' core transformer $52.90. ● ETI 4-way Speaker System (Feb '80) $439.00 (including all speakers and crossovers but not woodwork). ● Fully assembled boxes for 4-way Speaker System $300.00 pair

MANY MORE KITS ARE AVAILABLE IN OUR FANTASTIC RANGE — ASK FOR FREE BROCHURE.

MAIL ORDER: $1.00 plus 5% of order value up to $80.00, thence a flat $4.00. Heavy items sent "freight-on" through carrier.

RECORDS & TAPES — continued

For those who wonder about the word Partita, it is derived from Italian and is described as a set of related instrumental pieces, as a series of variations or a suite (L.D.S.)

☆ ☆ ☆

UNDER THE JASMIN TREE. Modern Jazz Quartet. World Record Club stereo WRC S/5348.

For those who don't know them, the Modern Jazz Quartet have been around a fair while now, since 1954 in fact. They are reputedly one of the top quartets in the world. Their sound is a little on the exotic side, with the famous Vibes of Milt Jackson and the triangle and finger-cymbals of drummer Connie (Conrad Kirton) Kay.

Unfortunately, on this record, I found the MJQ somewhat tedious to listen to. Their compositions and arrangements, all by quartet leader John Lewis, are too long and repetitive for my taste. Recording quality is good, although there is some tape hiss present at times.

Track titles are: The Blue Necklace — Three Little Feelings (parts 1, 2 and 3) — Exposure — The Jasmin Tree. (L.D.S.)

☆ ☆ ☆

NIGHT RAINS. Janis Ian. Interfusion L 37120. Festival release.

Janis Ian's new album is yet another masterpiece to add to her collection. The ten tracks range in style from ballads to up-beat numbers, all possessing her magical appeal. Seven of the tracks were written by Janis, one in collaboration with Albert Hammond and two in collaboration with Giorgio Moroder (Donna Sommer's producer).

Her current single "Fly Too High" is receiving plenty of air play.

This album is excellent and is a well deserved addition to anyone's record library.

The ten tracks on the album are: The Other Side Of The Sun — Fly Too High — Memories — Night Rains — Here Comes The Night — Day By Day — Have Mercy Love — Lay Low — Photographs — Jenny. (D.H.)

☆ ☆ ☆

MAKIN' MUSIC. Roy Clark & Gatemouth Brown. MCA 3161 Astor release.

Ten exuberant country style tracks from two of the greatest in the field make up the musical content of this disc.

The titles: Short Stuff — Justice Blues — Caledonia — Take The "A" Train — Talk About A Party — Four O'Clock In The Morning — Tabasco Road — Busted — The Drifters — J. H. Boogie.

There is plenty of good supporting talent listed on the sleeve and they make their presence felt all the way through an enjoyable record. (N.J.M.).

DAVE BRUBECK:

"most enjoyable . . ."

"BACK HOME" . . . The Dave Brubeck Quartet. Interfusion stereo L 37177. Manufactured by Festival Records Pty Ltd.

This is not the original Dave Brubeck quartet which had its 25th anniversary reunion back in March 1976. Rather, it is the new quartet with 59-year-old Dave and son Chris, together with Jerry Bergonzi who features on Tenor Sax and Electric Bass and Butch Miles on Drums. Son Chris plays Trombone and Electric Bass while Dave still does a mighty job on the piano.

This recording was made "live" and it is apparent from the crowd reaction that the popularity of the quartet is mainly due to Dave Brubeck rather than the younger members. This is natural enough. While the younger members are very proficient on their instruments, they do not yet have the consummate skill of Dave Brubeck. His is the superb sense of timing and sensitivity that makes the quartet work.

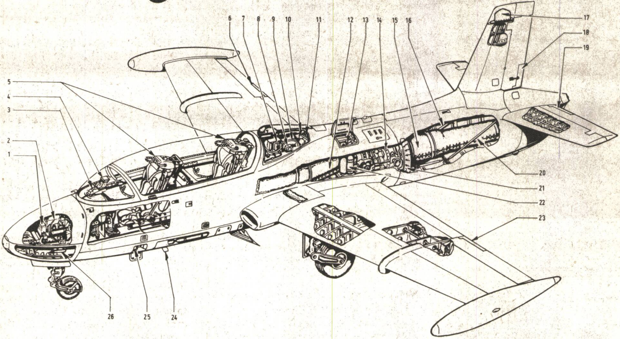
So do not be disappointed in this record by expecting the empathy of the original quartet. It's not there. But it is a most enjoyable recording, nonetheless. This applies particularly to the two last tracks on side one: "The Masquerade Is Over" and "Hometown Blues".

L-R: Chris Brubeck, Butch Miles, Kerry Bergonzi, Dave Brubeck.

Four other tracks are featured: Cassandra — Yesterdays — Two-Part Contention — Caravan.

Recording quality of this live performance is particularly good, although it is not touted as a direct disc or digital recording. There was some tape noise and surface "pickle" present in some of the quieter sections but this was not an obstacle to enjoyment. Overall, a good recording. (L.D.S.)

A blueprint for your success.



An Air Force Apprenticeship.

Opportunities no shop floor Apprenticeship can offer.

Right now, you can take an Air Force Apprenticeship and become a specialist in Airframes, Armaments, Radar, Communications, Propulsion Systems, Flight Systems or Motor Transport.

Full time training recognised and respected by Australian employers.

For the first 2½ years, you will be taught on some of the most up-to-the-minute equipment under the expert guidance of professional instructors. In modern laboratories, classrooms and workshops.

Understandably, when you have completed your initial training we expect you to spend another 6½ years working for us. On full adult pay of course.

It's not easy!

Success demands application. And a disciplined approach to work. As an Air Force Apprentice you'll be required to study in your own time. And regularly sit for exams. The rewards are there. Many Apprentices go on to become Officers.

It's not all work.

You will have stacks of time to relax provided you're on top of your studies. At both training bases (Wagga Wagga and Laverton) excellent sports facilities abound. Gyms, football grounds, golf courses, swimming pools, tennis courts and many clubs.

What about entry qualifications?

You need to be 15 and under 17 years at time of entry, an Australian citizen or able to meet our nationality requirements. We also expect you to have passed (or be in the process of passing) your *10th year of formal schooling with above-average marks in maths and science with a physics content. And be reasonably fit.

The scope for the future is enormous.

On completion of your Apprenticeship, you'll be part of a team servicing, repairing and testing some of the most advanced and sophisticated aircraft and equipment in the country. The technology of the future will be in your everyday working life.

Apply now!

Air Force Apprenticeships are very popular. So the sooner you have a chat with a Careers Officer the better. The address is in the phone book and there's no obligation.

Alternatively send or phone for the facts:

Brisbane: 226 2626	Townsville: 71 3191	Sydney: 212 1011	Newcastle: 2 5476
Wollongong: 28 6492	Wagga: 21 1100	Canberra: 82 2333	Melbourne: 61 3731
Hobart: 34 7077	Adelaide: 223 2891	Perth: 325 6222	

* 11th year will be required for 1982 entry for Certificate of Technology Scheme.

To:
AIR FORCE CAREERS
OFFICER, G.P.O. Box XYZ
in the capital city nearest you.
Yes! I am interested in an Air Force Apprenticeship. Please send me full details.

Name:
Mr:
Address:
State: Postcode:
Date of Birth: / /

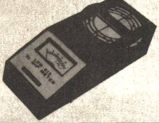
AFAP230.FP.30

You're somebody in Today's Air Force

Authorised by Director-General Recruiting Dept. Defence

LEADER TEST INSTRUMENTS

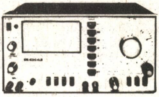
LDM-815 DIP METER



This popular device covers 1.5 - 250 mHz in 6 ranges.

STILL **$89**

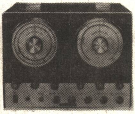
LDM 170 DISTORTION METER



20Hz-20kHz 0.3% F.S. Measures distortion, signal-to-noise ratio, signal levels.

$579

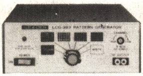
LSW 250 SWEEP GENERATOR



Sweep/marking 2-260 mHz continuously adjustable. Ideal for servicing TV, FM receivers.

ONLY **$398**

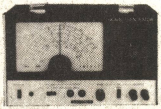
LCG 393 PAL PATTERN GENERATOR



6 patterns available. Ideal for the colour serviceman - 240Vac operating.

ONLY **$298**

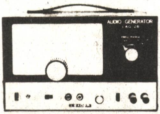
LSG 16 RF SIGNAL GENERATOR



100KHz-100MHz Solidstate RF signal generator. Suited for aligning the IF circuits in AM, FM and TV sets.

$129

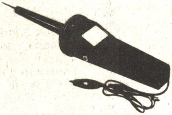
LAG 26 AF SIGNAL GENERATOR



20Hz-200kHz Stable generator for all types of audio circuit.

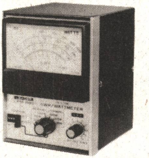
$159

LHM-80A HIGH VOLTAGE METER PROBE



Light weight high-impact plastic handle with arc-over protection. In put Impedance 20,000 ohms/volt. Range: 40,000 Volts.

STILL **$32**



LPM 885 SWR/ WATTMETER

Cover 1.8-54 mHz, measures power ranges of 20, 200 and 1000 W. A popular instrument!

OUR PRICE **$97**

Distributed by VICOM

VICOM

SOUTH AUSTRALIA
Electronic Components and Equipment
110 Tynte Street,
North Adelaide
(08) 267 2246

International Communication System
Dale Street,
Port Adelaide.

NEW SOUTH WALES
Radio Despatch Service
869 George Street,
Sydney.
(02) 211 0816

Custom Communications
Shop 11,
Parramatta Arcade,
Church St,
Parramatta. Ph. 635 6399

VICOM International Pty Limited
339 Pacific Hwy
Crows Nest. Ph. 436 2766

QUEENSLAND
Delsound
1 Wickham Terrace,
Brisbane, Queensland
(07) 229 6155

Fred Hoe & Sons
246 Evans St,
Salisbury North,
(07) 277 4311

CW Electronics
Cnr Marshall Rd and Chamberlain St,
Tarragidindi
(07) 48 6601

WESTERN AUSTRALIA
Atkins Carlyle
1-9 Milligan Street
Perth
(09) 321 0101

VICTORIA
VICOM International Pty. Limited
68 Eastern Rd,
South Melbourne
Ph. 669 6700

AMATEUR RADIO

by Pierce Healy, VK2APQ

Upsurge of interest in radioteletype

In recent years interest in radioteletype has been growing steadily among Australian amateurs, and there are now a number of groups, contests, and awards to encourage those interested in this mode. Modern technology is also contributing to this increasing interest.

For many years there has been a limited interest in RTTY among individuals and small groups around Australia. More recently, however, there has been an upsurge in activity in this mode. One reason has been the increased availability of mechanical teletype machines through disposals sources and another the formation of the Australian National Amateur Radio Teleprinter Society.

The ANARTS has made available, at very reasonable cost, kits for solid state modulators, demodulators, filters, power supplies and regenerators, together with technical advice and assistance.

Another aspect contributing to its wider acceptance is the availability of microprocessor systems, which can be interfaced with RTTY terminal units, and computerised type keyboards coupled to video display units.

The silent presentation of RTTY on a video screen has much to recommend it but, to some, the noise of a mechanical device is music to the ear. Others look upon RTTY as a more private means of communication than the voice modes. It is also practical to record information on tape for recall when required.

Whatever the reason for its use, the point is that RTTY is another means of fostering the inquisitive and inventive nature of amateurs and adding to the flexibility of the amateur service. It can provide the incentive to study a wide cross section of modern electronic technology, and the means to provide yet another, and very valuable, communication mode in times of emergency.

The ANARTS also provides a news broadcast each Sunday, as follows:

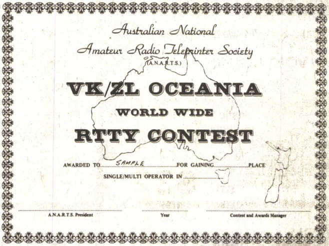
0030GMT: 14090kHz, 7045kHz, 146.6MHz.

0930GMT: 3545kHz, 146.6MHz.

All transmissions are 170Hz shift and 45.5 baud. Call backs are taken at the conclusion of each broadcast.

The ANARTS postal address is PO Box 860, Crows Nest, NSW 2065.

The ANARTS, sponsors of the VK/ZL/Oceania World Wide RTTY Contests, invite participation in the 1980 contest in June, 1980. Details are as follows.



Australian National

Amateur Radio Teleprinter Society

(A.N.A.R.T.S.)

VK/ZL OCEANIA

WORLD WIDE

RTTY CONTEST

AWARDED TO SAMPLE FOR GAINING .... PLACE

SINGLE/MULTI OPERATOR IN ....

A.N.A.R.T.S. President

Year

Contest and Awards Manager

This certificate will be awarded to the highest scoring contestants in the sections of the contest.

DATE: June 14-15, 1980.

TIMES: 0000-0800GMT Saturday, June 14, 1980; 1600-2400GMT Saturday, June 14, 1980; 0800-1600GMT Sunday, June 15, 1980.

CLASSES: (a) Single operator; (b) Multi-operator; (c) Shortwave listeners. Logs of multi-operator stations must be signed by all operators together with their call signs. Logs of SWLs must contain both number sent and number received by the station logged. Incomplete logs are not eligible.

NUMBER EXCHANGE: Serial numbers will consist of (a) RST report; (b) Zone number; (c) Time in GMT.

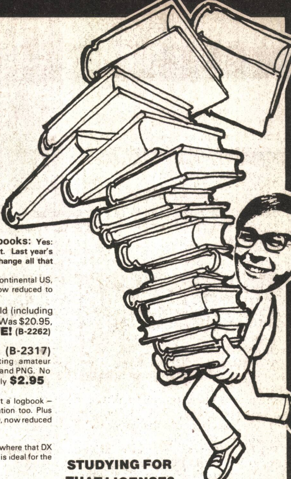
SCORING: As per Canadian Amateur Teleprinter Group zone chart (copy available from contest manager), multiplied by the number of countries worked, multiplied by the number of continents worked (maximum six). After the above calculations, world stations add 100 points for each VK/ZL station worked on 14MHz, 200 points for each VK/ZL station worked on 21MHz and 300 points for each station worked on 28MHz.

A station may be worked only once on each band but may be worked on another band for further multipliers.

[Example: 720 points from the zone chart multiplied by 29 countries worked, multiplied by five continents worked, equals 104,400 points, plus six VK/ZL stations worked on 14MHz (600 points) giving a total of 105,000 points.]

COUNTRIES: Countries count as per the ARRL list of countries, except that VK, ZL, JA, VE, VO, W/K districts count as separate countries. Contacts with one's own country carry no multipliers.

HELP!



Amateur Radio Book Stock Clearance

We're wildly overstocked with many of our popular Amateur Radio books. So much so that we've got to clear space for new stock arriving for our new catalogue. Here's your chance to *SAVE* on many titles: many of these prices are lower than those in our new catalogue! But remember: these prices are current only while current stocks last. *HURRY!*

Popular ARRL books

Electronics Data Book (B-2203) 128 pages of essential data for all involved in electronics; not just amateurs! **Still only $6.75**

Antenna Hand Book (B-2204) One of the most widely respected antenna books. Not just theory: designs too! **$8.75**

Antenna Anthology (B-2205) A collection of articles on antenna design, construction, etc. A must for every ham. **$6.25**

Hints and Kinks (B-2206) All those short cuts and ideas you'd normally forget in one handy reference volume. (Not many left!) **$6.90**

Radio Amateur's Operating Guide (B-2208) New to the game? Want to find out the correct way to do it – here's the answer! Save on this one: Was $6.90, **Now only $3.95 while stocks last**

Solid State Design for the Amateur (B-2211) 'A book of the highest quality' (EA mag.) For the thinking amateur who wants to design his own. Great value. **$12.00**

Radio Amateur's VHF Manual (B-2214) A thorough treatment including history, principles, test gear, etc. Practical, too! **$6.95**

SSB for the Radio Amateur (B-2212) A digest of articles on SSB from QST – theory and practice of SSB in detail. Was $6.75, **Now Only $5.00 while stocks last. Save!**

1979 ARRL Handbook (B-2219) May be out of stock by the time this advert appears. If not, you'll save $5.00!! Was $14.95, Now **$9.95!**

Getting to know OSCAR (B-2220) What OSCAR is all about, how to use it, how to set up your station. Easily understandable. Now save nearly 20%: was $5.50, now only **$4.50**

Radio Frequency Interference (B-2222) How to identify and cure RFI. Keep on side with your neighbours: and the RI! Was $5.50, Now reduced to only **$4.50!**

Solid State Basics (B-2224) Provides both the why and the how of transistors, ic's, and other solid state devices. Was $8.75; Now only **$6.75**

Mini Log Book (B-2235) Just the thing for mobile or portable use. All the data you need to record in a handy size. Great value at **$2.00**

DICK'S OWN 'Australian Amateur Radio Handbook' (B-2320) The first amateur book written just for Australia. In a relaxed, easy-to-read style, it's a great gift idea for anyone interested in the world of amateur radio. Only **$6.95**

Big savings on 1979 world callbooks: **Yes: great value for the ham or swl on a budget. Last year's callbook maybe, but the contents don't change all that much from year to year!**

US Callbook (B-2260) All the amateurs of continental US, Hawaii, its posessions etc. Was $21.95, now reduced to only **$17.50**

Foreign callbook: All areas of the world (including Australia) with the exception of the US. Was $20.95, now reduced to only **$17.50. SAVE!** **(B-2262)**

WIA AUSTRALIAN CALLBOOK (B-2317) The most recent Australian callbook listing amateur operators and registered SWL's in Australia and PNG. No amateur can afford to be without one! Only **$2.95**

EA Logbook (B-2258) More than just a logbook – contains loads of data and amateur information too. Plus plenty of room for your station log. Was $2.50, now reduced to only **$1.95**

World Atlas (B-2268) Ever wondered where that DX call actually came from. This handy size atlas is ideal for the shack. **$3.90**

World Prefix Map (B-2264) Not just great wall decoration for your shack: this map shows the amateur prefixes of all zones, too. **$2.20**

1979 World Radio TV Handbook (B-2081) Great value for SWL's and amateurs too. A listing of all known broadcast stations in the world including frequencies. Great for frequency checks! Was $15.95, now reduced to **$12.95!**

Reference Data for Radio Engineers (B-1104) Contains a wealth of data in its 1196 pages! Hundreds of charts, graphs, nomograms, etc. The ultimate reference book for anyone in electronics. Was $35.00, Now only **$28.00**

Radio Handbook (B-1106) Over 1000 pages; one of our most popular reference books. Easy to understand. Was $$25.00, Now only **$20.00!**

Amateur Radio Techniques (B-2040) By Pat Hawker of RSGB. Absolute bargain, 300 pages, covers just about everything! Only **$8.25**

Guide to Amateur Radio (B-2042) Another RSGB/Haker book. Assists the newcomer to ham radio in starting his shack and operating correctly. 112 pages. Great value at **$3.50**

VHF/UHF Manual (B-2054) Huge hard cover manual covers exciting world above 30MHz: with particular emphasis on microwaves. **$17.00**

80 metre DXing (B-2286) Includes all aspects of 80 metre operation, including antennas, proption characteristics, operating practices, etc. Was $5.50; now reduced to just **$3.90!!**

STUDYING FOR THAT LICENSE?

The Ham Exam Cram Book (B-2314) Great for that last minute revision. Typical questions and answers explained: A beauty! Only **$2.95**

1000 Questions for the Novice License (B-2316) From the WIA, covers everything from Ohm's law to the regulations. With answers. A bargain at only **$3.95**

Questions and Answers for the Novice License (B-2315) Put out by Westlakes Radio Club, this book covers all the typical questions you are likely to be asked – with answers. **$4.95**

500 Questions for the AOCP (B-2318) Similar to above books, but this one is for the big one: the full amateur license. It's money well spent at just **$3.50**

VHF Handbook (B-2300) Covers all major VHF subjects: propagation, antennas, repeaters, satellites, etc etc. Clear language, 336 pages. **$6.95**

Wire antennas (B-2302) How to build a large number of types of wire antennas, including 'invisible' types where neighbours might be a problem. Covers 160 to 2 metres! **$6.95**

Cubical Quad Antennas (B-2304) The world famous classic on Quads, revised to give new data and details of quad construction. Reduced from $5.50 to only **$3.90 SAVE!**

Beam Antenna Handbook (B-2306) Gives dimensions of beams from 6 to 40 metres, covers test instruments, baluns, etc. Only **$5.75**

DICK SMITH ELECTRONICS

NSW
125 York Street, SYDNEY. Ph 290 3377
147 Hume Highway, CHULLORA. Ph 642 8922
162 Pacific Highway, GORE HILL. Ph 439 5311
30 Grose Street, PARRAMATTA Ph 683 1133
396 Lane Cove Rd, NORTH RYDE Ph 888 3200
263 Keira Street, WOLLONGONG. Ph 28 3800

VIC
399 Lonsdale Street, MELBOURNE. Ph 67 9834
656 Bridge Road, RICHMOND. Ph 428 1614

QLD
166 Logan Road, BURANDA. Ph 391 6233
842 Gympie Road, CHERMSIDE. (Opening Soon)

ACT 96 Gladstone Street, FYSHWICK. Ph 80 4944
SA 60 Wright Street, ADELAIDE. Ph 212 1962
WA 414 William Street, PERTH. Ph 328 6944

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113. Ph 888 3200. PACK & POST EXTRA.

bankcard
welcome here

SHOPS OPEN 9AM to 5.30PM
(Saturday: 9am till 12 noon)
BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY
RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

AMATEUR RADIO

LOGS: Logs must show in this order: date; time; call sign of station worked; serial number sent; serial number received; points claimed.

CLOSING DATE: Logs must be received by September 1, 1980. Send logs to W. J. Storer, VK2EG, 55 Prince Charles Road, Frenchs Forest, 2086, NSW, Australia.

SUMMARY SHEETS: Must show: call sign; name of operator(s) and address; bands used (a separate log for each band); points claimed for each band; number of VK/ZL stations worked; total points claimed; and signature(s). Multi-operator station logs must contain the signature and call sign of each operator.

AWARDS: Will be issued for first, second and third on a world basis and also on a country basis.

The judges' decision will be final and no correspondence will be entered into. The logs become the property of the contest committee.

The contest committee thank all who participated in the 1979 contest. Here is an extract from the result of that contest.

The three highest scoring single operator stations were: G3HJC 319,700 points (100); HB9AVK 317,804 points (84); JA8ADQ 295,580 points (62). (Number of contacts are shown in brackets). Multi-operator stations: 15MYL 1,156,744 (184) points; VK2TTY 381,780 points (62); DK0MM 269,525 points (79).

SOUTH EAST QUEENSLAND TELETYPE GROUP AWARD

This award is open to all transmitting and listening amateurs.

Australian amateurs must score five points, overseas amateurs must score three points.

(a) To qualify, a station must copy the South East Queensland Teletype Group station, VK4TTY, during a news broadcast and, in the case of a transmitting amateur, participate in the call back (two award points). A portion of the news broadcast print-out together with the date, time, frequency and broadcast number are to accompany the application.

(b) Additionally, a transmitting amateur must work three member stations of the SEQTG on RTTY (one award point). Log extracts and/or print outs are to be included with the award application and each member station may be counted only once towards the award.

(c) Listening amateurs, should in lieu of (b), forward log extracts and/or print outs of three contacts involving different member stations of the SEQTG (one point each).

Applicants should forward the above information, together with $A1 or five IRCs (to cover postage and printing costs), to The Secretary, SEQTG, PO Box 274, Sunnybank, Queensland 4109, Australia.

MORE TV DX REPORTS

A report from an Austrian amateur advising reception of the Wagga ABC TV Channel 0 (January 1980 issue of these notes) has prompted other reports of TV DX. Two letters from Sydney readers set out details of signals received from Australian and overseas stations.

Because the frequencies are in the range 45MHz to 92MHz, a resume may assist amateurs interested in six metre (52-54MHz) operation. USA and Hawaiian paging systems on 35MHz and an Indian communication channel on 38MHz are also reported. The writers also refer to the types of propagation they consider were involved.

The first letter gives a daily report of stations logged during the first two and a half months of this year. During January, 1980, New Zealand channel 1 (45.25MHz) was logged on a number of occasions between 2100GMT and 0500GMT. Also logged were: January 16, China channel R1 (49.75MHz) between 1330GMT and 1404GMT; January 19, 2215GMT to 2355GMT NZ channel 2 (55.25MHz) and NZ channel 3 (62.25MHz); January 25, 2340GMT to 0108GMT South Australian stations ABNS 1 (57.25MHz) and ABRS 3 (85-92MHz).

During February, 1980, NZ channel 1 (45.25MHz) was regularly logged around the same time slot. On February 9 and 10, between 1200GMT and 1500GMT and on February 16 between 1035GMT and 1100GMT China channel R1 (49.75MHz) was logged. Australian stations TVQ 0 (46.25MHz) and ABAV 1 (57.25 MHz) were logged between 0630GMT and 0930GMT on February 4.

The second letter gives, in general terms, information on Australian stations received. Also China channel R1 received on March 31, 1979, and BBC channel B1 received on November 17, 1979.

Both writers would like to hear of any others interested in TV DX. Their addresses are: Mr T. Emslie, 56 Anthony Rd, West Ryde, 2114; and Mr R. Copeman, Box 2823 GPO, Sydney, 2001.

REMEMBERANCE DAY CONTEST RESULTS

Participation in the 1979 "RD" contest was well up to previous years, 1068 valid logs being received.

South Australia became the trophy holder for the next 12 months. The scores from all call areas were: VK1 — 15,800; VK2 — 4309; VK3 — 3428; VK4 — 8200; VK5 — 28,539; VK6 — 14,395; VK7 — 16,936.

TANDY
ELECTRONICS

FRANCHISE
OPPORTUNITY
For established retailers
COUNTRY AREAS

Now you can add extra profit, volume, traffic to your store by adding a range of the famous Tandy/Radio Shack Electronic products to your line.

If you have a successful store, (Hardware, Photographic, Furniture, Appliance, Sporting Goods, Toys/Hobbies, Chemist, Radio, TV, etc.) contact us now!

A minimum investment covering inventory and start-up costs can begin a new and exciting association with Tandy — a leader in home entertainment and electronics!

Write or phone:
Mr. E. Epps, Franchise Manager,
Tandy Corporation,
P.O. Box 229, Rydalmere, N.S.W. 2116.
Phone: (02) 638 4333

The smart counters

High resolution and easy operation for a low price

These new counters get it all together. The one-chip microcomputer design gives you high resolution and accuracy plus easy operation and compact construction… all for a low price.

The high resolution comes from the use of reciprocal frequency counting, which gives an intrinsically higher resolution without the traditional ± 1 cycle error. For example, a full 7-digit resolution is obtained in only one second. It therefore avoids the need for long gate times, period measurements or the limitations of phase-locked frequency multipliers.

Other big benefits that the microcomputer design brings are easy operation and minimal controls, since the built-in intelligence gives automatic triggering and range switching.

PM 6667: 120 MHz

Dimensions
160 x 77 x 180 mm

PM 6668: 1 GHz

- ☐ Microcomputer contro
- ☐ Self-diagnostic routine
- ☐ Reciprocal frequency counting
- ☐ High-stability TCXO: 10^{-7}/month
- ☐ Auto-triggering on all waveforms
- ☐ High-contrast liquid crystal display

PHILIPS Test & Measuring Instruments

PHILIPS

Please send me full details on Philips' "Smart Counters"

Philips Industries,
Test and Measuring Instruments
Dept., TQ III-2-51,
Eindhoven,
The Netherlands

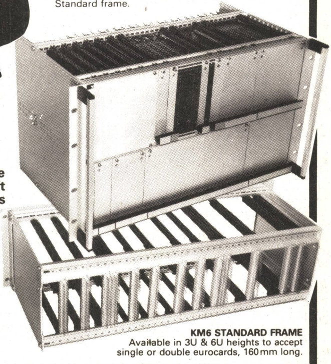
---

vero

a frame for the future

vero

KM6 UNIVERSAL FRAME
A range of frames providing maximum versatility and embodying all the features available on the Standard frame.



A new concept in Sub-rack design, satisfying the requirements of DIN 41494, IEC 297 and SC48D draft specifications. Designed to accept indirect connectors to DIN 41612 and the related V.G. specs.

- Trouble free assembly, without need for subsequent adjustment.
- 3U and 6U high. 6U divided versions available.
- Wide range of module widths, guaranteeing strict alignment, coupled with elegant appearance.
- Cassette modules.
- Integral Busbars up to 5 levels to ensure good power and signal distribution.
- Horizontally and vertically hinged panels.
- Dust covers.

KM6 STANDARD FRAME
Available in 3U & 6U heights to accept single or double eurocards, 160 mm long.

ALL THIS AND NOT A SELF-TAPPING SCREW IN SIGHT (machine threaded screws used throughout).

WF WARBURTON FRANKI

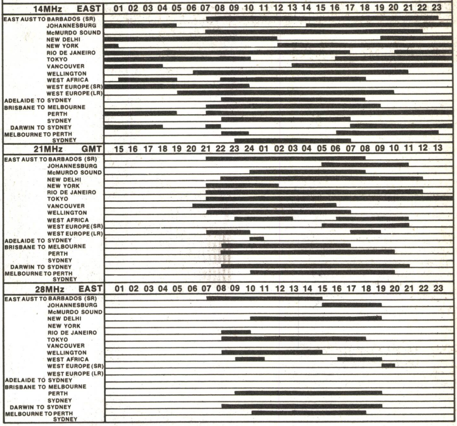
- ADELAIDE 356-7333 • BRISBANE 52-7255 • HOBART 23-1841
- MELBOURNE 699-4999 • PERTH 277-7000 • SYDNEY 648-1711

WF671/79

AMATEUR RADIO

IONOSPHERIC PREDICTIONS FOR MAY

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open. 5.80



RADIO CLUB NEWS

LOWER EYRE PENINSULA AMATEUR RADIO CLUB: Call sign: VK5ALE; Headquarters: SES Building, Robertson Road, Port Lincoln, South Australia. Postal address: Box 937, Port Lincoln, 5606.

Club net: Every Friday night 8-9pm local time on 3560kHz.

Club meeting: First Wednesday each month 8.00pm.

CENTRAL COAST AMATEUR RADIO CLUB: Held its 23rd annual field day on Sunday, February 17, 1980. The attendance was 790, consisting of 495 men, 157 ladies, and 138 children. Again it was a very successful event with a high family participation.

All events were keenly contested and there was an excellent array of prizes presented to the first and second place-getters.

There was a large display of latest amateur and electronic equipment provided by major suppliers, a disposals market, an amateur television demonstration, and a ladies stall which sold a wide range of home-made jams, cakes, biscuits, and knitted and crocheted articles.

The CCARC extends its sincere thanks to the magazines who publicised the event, to the business houses and individuals who donated prizes, and to the amateurs, families, and friends who attended and made the day such a success.

EASTERN & MOUNTAIN DISTRICT RADIO CLUB: The March, 1980, issue of their magazine "The Radio Bulletin" carried an interesting article on the restoration of the HMAS Castlemaine by the Maritime Trust of Australia.

Members of the Royal Navy Amateur Radio Society (Australian branch) have undertaken the restoration of radio equipment and the installation of an amateur station (VK3BZU).

Any amateur with a naval background, interested in the project, should join the RNARS Australian net on 3615kHz on Monday evenings at 1030GMT.

The EMDRC nets are held on 28.470MHz Sunday mornings at 9.30am; Wednesday evenings on 3620kHz at 8.00pm. There is also a RTTY broadcast Tuesday evenings at 8.00pm on 146.600MHz.

GEELONG AMATEUR RADIO-TV CLUB: The club's six-metre beacon, previously on low power on an attended basis, should by now be installed and operating from Mt Anakie on 52.033MHz with a power of 25 watts. Reception reports will be appreciated.

The club meetings are held in the club rooms, Storrer Street, East Geelong every Friday night at 8.00pm. Postal address is PO Box 520, Geelong 3220.

MOORABBIN & DISTRICT RADIO CLUB: Honorary membership of the club is available to overseas stations who contact seven members of the club. Australian amateurs must contact 14 members. Visitors are welcome to the monthly meetings, held on the third Friday of each month. The address is Combined Clubs Hall, Turner Road Reserve, Highett, and the club call sign is VK3APC. Postal address PO Box 88, East Bentleigh Victoria 3165.

WAGGA AMATEUR RADIO CLUB: As in past years, members spent the weekend on Mount Flackney during the John Moyle Memorial National Field Day. A good time, both socially and on-air, was had. As usual, multiple band operation was undertaken using the call sign VK2WG. A total of 9650 points was scored.

Members also provided communication (as a WICEN exercise) for the annual Gumi race on the Murrumbidgee River. Two metre FM, using channel 3 repeater and simplex channel 40, was used between the Wagga Rescue Club boats and a base station at WRC headquarters.

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

SO YOU WANT TO BE A RADIO AMATEUR?

To achieve this aim, why not undertake one of the Courses conducted by the Wireless Institute of Australia? Established in 1910 to further the interests of Amateur Radio, the Institute is well qualified to assist you to your goal. Correspondence Courses are available at any time. Personal classes commence in February each year.

For further information write to
THE COURSE SUPERVISOR,
W.I.A.
P.O. BOX 123,
ST. LEONARDS, NSW 2065

L. E. CHAPMAN

122 PITT ROAD, NTH CURL CURL.
MAIL ORDERS: BOX 156, DEE WHY, NSW. 2099.
TELEPHONE 93-1848.

RESISTORS

150 ohm, 5W	20c
10 ohm, 5W	20c
47 ohm, 5W	20c
12 ohm, 3W	20c
2.5 ohm, 3W	20c
33 ohm, 3W	20c
8 ohm, 10W	25c
4000 ohm, 10W	25c
100 ohm, 5W	20c
330 ohm, 10W	25c
220 ohm, 5W	20c
5 ohm, 5W	20c
220 ohm, 10W	25c
950 ohm, 3W	20c
115 ohm, 5W	20c
10 ohm, 5W	20c
1k ohm, 5W	20c
5000 ohm, 5W	20c
6.8k ohm, 3W	20c
330 ohm, 10W	25c
6800 ohm, 10W	25c
1500 ohm DUAL, 21W	50c
50 ohm, 5W	20c
330 ohm, 5W	20c
1k ohm, 5W	20c
820 ohm, 5W	20c
12 ohm, 10W	25c
470 ohm, 7W	20c
4700 ohm, 4.5W	20c
5000 ohm, 10W	25c

ELECTROS

470uF, 25V	5 for $1
400uF, 10V	5 for $1
47uF, 63V	5 for $1
350uF, 16V	2 for $1
27uF, 160V	5 for $1
25uF, 63V	10 for $1
22uF, 160V	10 for $1
47uF, 16V	5 for $1
47uF, 200V	5 for $1
220 uF, 10V	10 for $1
68uF, 16V	10 for $1

CAPACITORS

0.0039uF, 1500V	20c ea.
6N8, 1500V	20c ea.
0.0068uF, 1500V	20c ea.
1200PF, 400V	10 for $1
0.068uF, 400V	5 for $1
2200PF, 630V	10 for $1
0.47uF, 250V	10 for $1
0.10uF, 400V	5 for $1
0.082uF, 160V	10 for $1
26k, 250V	10 for $1
0.041uF, 400V	10 for $1
0.033uF, 250V	5 for $1
0.027uF, 100V	20 for $1
220uF, 10V	10 for $1

Power leads 240 volt, suit most tape recorders, radios, etc. $1 each.

TV Stick Rectifiers 20SC, $1.00.

Philips Colour TV Convergence Boards, $3 each.

455KC IF Transformers for valve radios, $1 each. Also aerial and OSC coils, 75 cents each.

Slide Pots

250K-50K	3 for $1
Dual 500K	3 for $1
1 Meg	3 for $1
2 Meg	3 for $1

Including Fancy Gold Knobs

SPECIAL

100 mixed resistors, all useful	$2.
100 mixed capacitors, fresh stock	$2.

AUDIO LEADS

3.5m to 3.5m, 7ft	75c
3.5m to 6.5m, 7ft	75c
6.5, 7ft	50c

MICRO SWITCH

5A, 250V AC	75c ea.

TUNING CAPS

2 and 3 gang	$1 ea.
Min 2 gang	50c

FUSES

0.5A, 2A, 3.25	10 for $1
In line fuse holders	30c
RCA jack plugs and sockets	40c pair

SPECIAL TRANSISTORS

AD161-162	$2.50 pr
BSC 901A	$1.50 ea.
BC 548	10 for $1
AD 149	$3 pr

TRIM POTS

470 ohm	10c
200K	10c
10K	10c
1K	10c
1 MEG	10c
50 ohm	50c
250K dual gauged double pole switch LOG	$1.00
1 Meg gauged LOG	75c
2 Meg gauged LOG	$1.00
10K gauged LOG	50c
2 Meg gauge LIN	$1.00
1 Meg gauged double pole concentric	$1.00
10K gauged concentric double switch	$1.00

- Telescopic aerials, $1.50
- Top quality, low impedance microphones, $3.50
- 6 inch ferrite rods, 75c
- Rainbow lead, 5 strand, 20c per metre
- Line output transformers, 600 ohm, to 15 ohm, 20 watts, $5
- Line output transformers, 1200 to 3/ohm, 5 watt, $1
- Power supply units, filtered, 240 to 20 volt, $12
- 240 to 15 volt transformers, $3.50.

DIODES

OA 626	4 for $1.00
OA 662	4 for $1.00
EM 410C	4 for $1.00
DS 150A	50c
DSY 130YO	50c
OA 636	50c
HR 15	50c

POTS ROTARY

½ Meg	30c
1 Meg	30c
100K	30c
100K Switch	50c
50K Double Pole Switch	50c
7.500	30c
10K Switch	50c
250K	30c
50K	30c
20K	30c
10K Min Pots	25c
50/Ohm	50c
½ or 1 Meg Switch	50c

SPEAKER SPECIALS

6 x 9	$6.00
7 x 5	$4.50
5 inch 3.5/ohm	$3.50
5 x 3	$1.50
2¾ inch	$1.50
2½ inch	2 for $1.00
6 x 9 27/ohm	$6.00
6 x 9 47/ohm	$6.00

PILOT LIGHTS

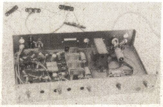
Screw in 6.3V	10 for $10.50
24V	10 for $1.00

- Car radio suppressors, 3 for $1
- 3 position slide switch, 50c
- Toggle switches, 25c
- 2 position push button switch, 50c
- 6 position push button switch, $1
- 4 position push button switch, 75c
- Transistor ear plugs & leads, 3 for $1
- In-line fuse holders, 4 for $1
- 4 pole 2 position rotary switches, 50c

Vortex tape deck motors

110 volt	$7.50

ROTARY POTS



STEREO AMPLIFIER
10 WATTS RMS
PER SIDE
$25

P+P NSW	**$2**
INTERSTATE	**$3**
WA	**$4**

Special: 100 mixed capacitors, fresh stock, all useful.

$2.00

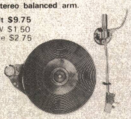
RECORDING LEVEL METERS

$2.50

SUPER SPECIAL

GRAMOPHONE motor and pickup 3 speed stereo balanced arm.

240 volt $9.75
PP NSW $1.50
Interstate $2.75
WA $4

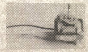


Miniature speaker and drive output transformers	$1 pr
Special mixed tag strips	10 for $1

24V MOTORS

Reversible

Only $2.50 ea.



SPEAKER SYSTEMS

Inc. two 5 x3 speakers, 5W RMS, $4.75 ea. P&P NSW $1.75, Interstate $3.00, WA $4. (For singles or pairs).

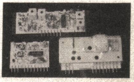
TV TUNER VALVE TYPE

$2.50
inc. valves.

P&P $1.00
Interstate $2.50

SUPER SPECIALS

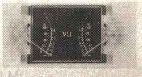
FM STEREO TUNER KITS



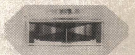
Sets of 3 modules include FM tuner, decoder and IF detector. Circuit diagram supplied. Can be used with amp modules.

ONLY $18.00
P&P $1.00

VU & BALANCE METERS



STEREO VU **$3.00**



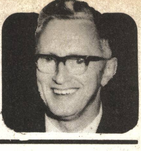
12Kn 100uA **$2.00**

PHILIPS TV TUNERS

Transistor NT3024, NT3030, NT3032, Colour — P&P $1.

$10 ea.

SHORTWAVE SCENE



by Arthur Cushen, MBE

Chinese tune to foreign broadcasts

As reported last month, China is now actively promoting Chinese-English lessons over its many regional stations. The Chinese are also being encouraged to listen to foreign radio broadcasts and large numbers of letters are starting to flow to the international shortwave stations.

Several Chinese regional stations broadcasting Chinese-English lessons have been noted over the past few months as education by radio proceeds throughout China. Recent figures show that one person in every 11 in China now has a radio receiver. As well as internal education by radio, Chinese listeners are looking abroad for information. Radio Australia recently reported that 126,000 letters were received last year from listeners in China tuned to broadcasts from Melbourne.

The task of answering this mail is enormous, and the correspondence section of Radio Australia recently employed 10 Vietnamese refugees to help meet this new challenge. However, this could be discontinued because of a shortage of funds.

BROADCASTS FROM PEKING

The present Radio Peking went on the air in 1950 and commenced broadcasting in seven languages. Today 39 languages are broadcast to a worldwide audience. Radio Peking's programs include news, commentaries on domestic and international events, regular features and music. Regular features include "Across the Land", "China in Construction", "Culture in China", "Travel Talk", "Listeners' Letterbox", and "Music from China". There are also programs to teach spoken Chinese during English, Japanese and French language transmissions.

Letters sent to Radio Peking are often answered in "Letterbox" while verifications are issued for correct reception reports. The reports should indicate the language section to which the letter is directed. The only address necessary is Radio Peking, Peking.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

In the 1930s, the former regime operated the Chinese International Broadcasting Station at Chungking, while many local stations were heard on shortwave as well as some privately owned stations. In the late 1940s, before the overthrow of the former government, several United States Forces Stations operated in China. Typical of these was XMAG on 4275kHz, and XRAY, Peking, which operated with 400W.

Our vertifications of these American Forces Stations and local Chinese broadcasters during this period are extensive, although many were on such low power that they would be difficult to receive these days, and were even a challenge in the 1940s.

THE VOICE OF ISLAM

According to a BBC report, a station is to be set up in Nigeria using the slogan "The Voice of Islam". It will be the first Islamic religious station outside the Arab world. Islamic broadcasting stations are increasing and the Holy Quran at Riyadh in Saudi Arabia has extended its output from six to 18 hours a day. The broadcast can be heard from 0600-0755GMT on 17815 and 21625kHz; from 0800-1100GMT on 17890 and 21625kHz; and 1800-2100GMT on 11685 and 15240kHz. The balance of the schedule is carried on medium-wave.

One of the more unusual locations for a Holy Quran station is on board a ship. "Mebo 2", known as the "North Sea International" when broadcasting in the English Channel, is now located in a harbour at Tripoli and carries Holy Quran broadcasts on 7165kHz.

TESTS FROM DUBAI

Early this year, tests were observed from Dubai when the first of three 300kW transmitters was put into operation. The test transmissions were carried out on 21500kHz 0300-0500GMT and first noted by George Kuznecovs of Adelaide, who reported good reception. Since then the transmitter has been heard carrying English announcements that the test was directed to Australia, New Zealand and the Far East. Reception reports should be sent to PO Box 1695, Dubai.

The frequency has also been observed with relays of the Arabic Home Service program around 0730GMT. Dubai has registered several frequencies on which future test transmissions could be carried and these are 7105, 9590, 9680, 9755, 11730, 11830, 15110, 15115, 15160, 17710, 17790 and 21480kHz. Dubai is in the Persian Gulf area and is one of the United Arab Emirates.

EXPANSION OF RADIO NORWAY

Plans have been announced by Radio Norway to increase the power of its shortwave transmitters, and tests should begin late next year. The international service of Radio Norway had its beginning in 1947 with the commissioning of a 100kW transmitter. Previously a lower power service relayed the domestic program.

Today Radio Norway broadcasts in 90 minute time segments 11 times a day. All programs are in Norwegian except on Sunday, when the last 30 minutes are in English.

A new transmitting centre for shortwave operation is being built on the southwest coast of Norway. It will consist of three shortwave transmitters of 500kW each and one medium-wave transmitter of 1200kW, and is expected to be operating by 1982. The installation will employ curtain antennas for shortwave in addition to a log periodic antenna.

Radio Norway recently discontinued the DX program segment of its 30 minute Sunday English broadcast due to time limitations. However, when the new high powered transmitters are in-

SHORTWAVE SCENE

stalled, the English schedule will be expanded and the DX session will be reintroduced.

Radio Norway verifies reports promptly by airmail and also sends a program magazine four times a year. The address is Radio Norway, Overseas Service, Oslo, Norway.

RADIO NACIONAL BRAZIL

The high powered Radio Nacional transmitters at Brazilia have been noted opening at 2000GMT on the new frequency of 15125kHz with a broadcast in English to Europe. This transmission was previously carried on 15270kHz. The broadcast suffers from side-band interference from transmissions on either side of 15125kHz and is not as strong as the old channel, although reception could improve as we move into winter.

Programs in Portuguese from the Amazon area continue to be received from Radio Nacional at Brazilia on 11780kHz at 2000GMT, with signals at a fair level. A broadcast in Portuguese beamed to the Amazon area has also been heard on 15445kHz.

FURTHER HCJB TESTS

Low power tests of HCJB Quito, Ecuador, on 26000kHz and later on 26020kHz with only 100W have been so successful that the stations plans to continue the high frequency broadcasts. In a letter received by Stephen Greenyer of Invercargill, NZ, the station engineer stated that from November 1979, when the transmitter was changed to 26020kHz, the primary purpose of the tests transmissions was to evaluate the usefulness of this band as well as to provide DX'ers with the challenge of receiving a weak signal.

A modified Johnson Viking transmitter was used with a power of 100W. The antenna is a half-wave dipole which is 10 metres above ground and which favours signals to the northeast and southwest. Reports have been received from Europe, North America and New Zealand and, as significant interest has been shown by DX'ers, the power will be raised to 1000W and a directional antenna used to improved signal quality.

HIGH POWER FOR INDONESIA

The External Service of Radio Republik Indonesia has been operating since the late 1940s, but has never provided listeners in Australia with a reliable signal. Information from the BBC Monitoring Service indicates that the capacity of Radio Republik Indonesia's International Service will be increased in the near future. A 30 million franc loan from France will be used to buy two 250kW transmitters for this purpose.

At present English is broadcast at 0100-0200, 0800-0900, and 1400-1500GMT on 11790 and 15200kHz using 100kW transmitters.

VOICE OF LEBANON

Some confusion could exist concerning reception of the Voice of Lebanon on 6550kHz. This station is operated by the Christian controlled Lebanese National Movement whereas Radio Lebanon is operated by the State. Broadcasts on 6550kHz have been noted at 1800GMT with a program in French, and at 1815GMT when news in English is broadcast. The transmission is blocked at 1830GMT by Radio Peking which opens on the channel with a broadcast in French. The power is understood to be 16kW, and the mailing address is Box 165271, Beirut, Lebanon.

NEW ANKARA CHANNEL

Ankara, Turkey, has been heard opening at 0425GMT on 15225kHz with a relay of the home service. The same transmission is noted on 9515kHz when a relay commences which includes the interval signal and station announcement. At 0430GMT a program in Turkish is heard.

Ankara has also been noted with an English broadcast 2030-2130GMT on 11955kHz. This program is also carried on the new channel of 9550kHz. A second broadcast 2200-2255GMT is on 7215, 9515, 9550 and 11955kHz. A service to Asia 1200-1300GMT is also broadcast from Ankara on 11800 and 17820kHz.

LISTENING BRIEFS EUROPE

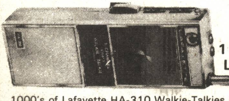
FRANCE: Paris has been observed on 3965kHz opening in French at 0700GMT by Bryan Clark of Auckland, NZ. The power on this frequency is only 4kW but signals have been received at fair strength during the first 30 minutes of the program which includes news and music and the usual France International announcement.

GREECE: Athens has recently made a frequency change to its service to North America with the transmission now on 11730, 17830 and 21570kHz. The broadcast is 1200-1250GMT and consists of news and entertainment in Greek and a news bulletin in English from 1215-1230GMT.

ICELAND: Reykjavik has been heard on 12175kHz from 1200GMT with Icelandic folk music and news. Peter Jones of Hamilton and Leigh Morris of Palmerston North, reporting in the "New Zealand DX Times", indicate that transmissions are irregular.

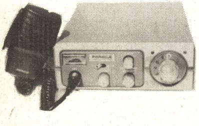
Lafayette)) TWO-WAY RADIO

FOR INDUSTRY, FARMS BOATS, SPORTS, ETC.



1 WATT 3 CHANNEL LAFAYETTE HA-310

1000's of Lafayette HA-310 Walkie-Talkies in use in Australia. 100,000's throughout the world, attest to their superior qualities. A professionally designed, sturdily constructed, commercial quality unit for top performance and long term reliability. Rechargeable Nicad battery packs and large range of accessories available.



Pinnacle PE-920, 6 channels, 5 watts, transceiver for 27MHz marine, within premises and limited area services. Ideal mobile or base station unit. Design eliminates unwanted image interference from CB stations Up-to-the-minute design with all wanted features.

P & T Dept Approved (Licence Required)

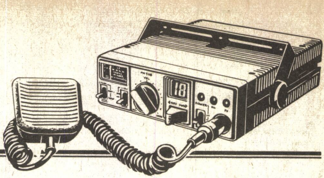
Lafayette are 2-way specialists. Large range of crystals, antennas, auxiliary equipment available!

Dealer enquiries invited.

Lafayette)) the Communicators

LAFAYETTE ELECTRONICS Div. of ETD Electronics Pty Ltd
94 ST KILDA ROAD, ST KILDA, VIC 3182. Tel 534 6036.

The Australian CB SCENE



Criticism — and the need for a better image

It is gratifying to know that the "Australian CB Scene" is being widely read and the response received to date has been gratifying, to say the least. But one "knocking" letter from R.R. does more or less demand that I put the record straight.

Mrs Jo Souter, of Bargo.

First off, R.R. addresses me as "Sir". Sorry, everyone; as you may have observed from the April issue, I am a woman.

Then he deplores my use of the word "band" in the title "Citizens Band Radio Service", claiming that it is an affectation within NCRA circles only. It is true that the NCRA made a submission in 1978 requesting that the name of the Service be altered from CRS to CBRS; the submission was duly accepted and CBRS is now its correct title.

If R.R. wishes to verify that statement, he may care to seek out a copy of document RB14 issued in July 1978 or thereafter. It is headed "Conditions governing the Licensing and Operation of the Citizens Band Radio Service". Furthermore, correspondence I have on file from both the Minister and the Department use the term CBRS.

Comments followed, in the letter, on the desirability of 27MHz transmissions ceasing in 1982; also on spectrum anarchy, with "users openly advertising units for sale with 800 channels, 1kW linear amplifiers, beam antennae, etc."

CB operators of Australia are well aware of the Government's stated intention to remove us from the HF band in 1982, but we refuse to accept it without a fight. Would the "hams," having been told that they have X number of years to use their equipment, meekly accept such an edict? I think not.

As for the people using illegal equipment, they are simply not CBers, any more than they are amateurs. They are "pirates". CB operators are the ones who work within the scope of the CBRS.

Whatever the aspirations of the NCRA, it has neither the authority nor the ability to correct this situation. Administration of the law is a matter for the P&T staff.

After that, a word of acknowledgment and thanks to others who have written in during the month; I will try to respond in the appropriate manner. But why should Western Australia be the state most strongly represented in the mailbag?

Now on to a completely different subject, and one which I am sure you will all find of interest. It provides an example of how CB really should be put to use. Operators who read this column should take a long, hard look at themselves and realise that there is much which we can all do in the community to be of assistance and to help clean up our rather tarnished image.

In the small town of Bargo, New South Wales lives a lady who is a credit to her community, and to CB. Her name is Jo Souter. Jo monitors the Highway Channel (4) during peak school hours to warn the truckies and anyone else using the busy road near the local school that children are crossing.

To quote from Jo's letter: "I first started the monitoring last November, after walking the kids to school and seeing so many near misses.

"I sit across the road from the newsagent (who thought it was a fantastic idea). My message is to the point: 'All you north and south bound big wheels please take care, as school children use the crossing between 9am and 9.30am and between 3.30pm and 4.00pm'."

Jo realises that speeding private cars are a worse hazard than the trucks but, as yet, not many cars are fitted with a CB transceiver. So Jo does the best she can.

I would be delighted to hear, at first hand, of more initiatives like this. There are many things we can hold up our heads over: monitoring teams, helping to find lost children, helping to forestall crime, raising money for charity, etc. It would be a change to read about some of the activities, in place of the hammering which CB takes from the non-CB fraternity and from the media. But I need up-to-date information immediately.

The 8th NCRA National Council meeting has come and gone. It was held at Brassey House, Canberra on the weekend of March 1 and 2. The main point to come out of it (apart from the elections which I will report on next issue) is the fact that the Association's patience with the Minister, Mr Staley has finally come to an end over his almost total lack of correspondence in reply to questions put to him by the National Secretary.

The Council instructed the Secretary to advise the Minister that, should satisfactory replies not be received within 14 days of the letter being posted, a formal complaint would be lodged with the Federal Ombudsman.

One can well understand that the Minister may have his plate very full with FM broadcasting, TV networking, communications satellites and all the rest, but that does not excuse him from attending to — or delegating — communication on other matters. The NCRA is trying to communicate with, and relate responsibly to the P&T Department. It does not help to have its correspondence ignored.

If you would like to write to me (whether you agree with me or not) please do so. My address is PO Box 406, Fortitude Valley, Brisbane, 4006.

Until the next time, Happy CBing.

Jan Christensen

New Products

Hioki 3012 drop proof multimeter

Rugged construction, convenient size and high performance are just some of the features of the Hioki "Drop Proof" Pocket Hi Tester Volt Ohm Meter that make it ideally suited for field use. The VOM is claimed to be drop-proof with meter functions unimpaired even if the instrument is dropped from a height of a metre.

The 3012 VOM comes in a cardboard box and is supplied with a soft vinyl case and a carrying strap for attachment to the wrist. Measuring 83mm wide x 138mm high x 26mm deep and weighing 250 grams, the instrument is easily carried in a breast pocket and fits comfortably into the hand.

Both fuse and diode overload protection is provided, the fuse being housed in the VOM case. Additional features are the instruction card, which is small enough to fit within the carrying case, and the non-slip test probes. We particularly liked the stress relieving reinforcement of the connections to the test probes, which prevents the normally rapid breakage at these points.

A mirror behind the pointer of the Hioki taut-band movement will if correctly used, prevent parallax error of the readings. There are three easy-to-read scales, 0-30, 0-10, AC/DC and an ohms-scale reading from zero to infinity. The 0-10 scale has 4% extended gradation markings so, for example, it is possible to read up to 104V on the 100V range.

The function select/range switch is positive yet light in operation. The "ohms adjust" control is purposely stiff in operation to prevent unwanted movement by accidental knocks etc.

DC voltage ranges are from 0.3, 3, 10, 30, 100, 300 and 1000V, while the AC voltage ranges are 10, 30, 100, 300 and 1000V. The meter impedance is 20k ohms per volt for DC voltages up to 300V and 10k ohm per volt on the AC ranges and 1000V DC voltage range.

Measurements of voltages beyond 300V is made with the probe in the 1000V socket and the selector switch set on the "300 and up" position. An AC-coupled output socket is provided for the AC range.

DC current ranges are 50 microamps, 1, 3, 30 and 300mA, with a "burden voltage" (voltage drop across the meter) of 300mV. No AC current range is provided. The ohms range will measure in x1, x10, x100 ohm settings and the open circuit output is 1.65V. This low output voltage will allow semiconductor devices to be checked without the risk of damage.

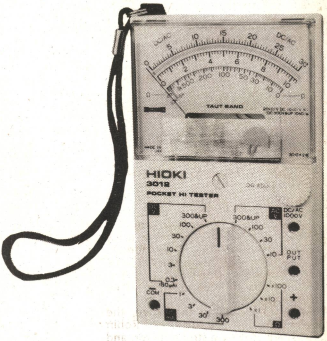
Accuracy of the readings is claimed to be ±3% of full scale for the DC voltage and current measurements, ±4% of full scale for the AC voltage measurements and ±3% of scale length for resistance measurement.

We checked the accuracy of the meter and found the current and voltage ranges to be accurate to within the specified limits. For example, on the DC voltage 0-10V scale a value of 4.85V was read for a 5.00V source. This value is within the ±0.3V error range.

The resistance measurements, although within the claimed accuracy, can only be used as a guide to the actual resistance. For instance, measurement of 1.0M megohm will give a reading of something between 500k and 1M. Measurements up to 30k ohm will result in no more than a 10% error in the reading, which is quite acceptable for checking the value of 10% tolerance resistors.

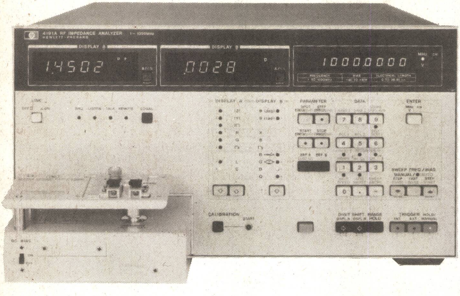
Generally the 3012 VOM is a very rugged device with reasonable accuracy. It is well designed, and should last for many years even with rough usage. The meter is ideal for servicemen and others who demand a rugged and reliable VOM.

The price of the Hioki 3012 is $56.90 plus sales tax where applicable. Trade enquiries hould be directed to H. Rowe and Co. Pty Ltd Unit 1, 127 Newbridge Road, Moorebank, NSW 2170. (JC)



The uncluttered design and highly readable scales make the Hioki 3012 very easy to use. The hard hat symbol on the face of the meter attests to the rugged construction of the instrument.

HP Microprocessor-controlled RF Impedance Meter



Recently released by Hewlett-Packard, the Model 4191A RF Impedance Analyser is capable of measuring 14 impedance parameters over the 1MHz to 1GHz frequency range with a basic accuracy of .5 to 2%. The measurement range is from 2 milliohm to 100k.

Main features of the Model 4191A include an internal frequency synthesiser, automatic calibration, automatic error correction, and a 4½-digit resolution. In addition, the unit features an internal bipolar DC bias source (0 to ±40V), linear and log sweep capability of both frequency and bias, self test and deviation measurement capability of all 14 parameters.

The 4191A can thus evaluate capacitors, inductors, and resistors over a wide range of frequencies, DC bias, and impedance to give the design engineer an indication of how these devices will behave in an actual circuit. Other applications include the analysis of signal propagation characteristics of communications devices and the evaluation of electronic materials prior to component fabrication.

Further information can be obtained from Hewlett-Packard Australia Pty Ltd, 31-41 Joseph St, Blackburn, Vic 3130.

ROBIN GENERATING SETS

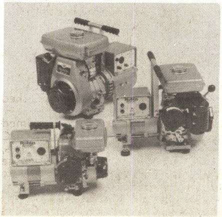
Crommelins Australia has announced the introduction of the new LG range of Robin generating sets from Fuji Heavy Industries of Japan. The three models in the LG series are intended to complement the more powerful RG series, and provide portable petrol driving generators for the leisure and light-use market.

The first model in the range, the LG071 weighs 18.5kg, features a Robin air-cooled EC06 two stroke motor, and provides a maximum output of 700W at 240V AC and 8.3A at 12V DC. The noise figure given is 66dB at five metres.

The LG101 weighs 26kg with a 3.5hp engine, and provides 1000W at 240V AC and 8.3A at 12V DC. The third model, the LG151 provides 1500W at 240V AC and 8.3A at 12V DC, and weighs 37.5kg.

All the units feature automatic voltage regulation, maintaining output voltage within ±3%. Dual AC outlets are provided, as well as a voltage meter and terminals for battery charging.

Further information is available for Crommelins Australia, 18 Oxford St, Leederville, WA 6007.



printed circuits

- Accurately machine printed etched
- Phenolic & fibreglass-gold tin plated
- EA R & H ET Philips Mullard available
- Specials to your drawing
- POSTAGE small 80c large $1.10.

	$		$		$
80AW4	4.00	80GPS3	2.80	80F3	2.80
80C14	2.80	496	5.00	ET152	2.80
466	6.00	496G	6.50	726	8.00
80AU3	3.00	80CM3A	3.20	80CM3B	2.80
264	2.50	561	2.80	455	3.00
322	2.80	80GA3B	3.20	80GA3A	5.00
80S1	2.50	79SB10	2.80	ET474	2.80
ET560	2.80	ET452	4.50	ET321	3.50
ET151	2.50	80SA3	4.50	79FE11	2.80
79D10	2.80	79EB12	2.80	79PC12	2.50
79TI11	2.80	ET270	2.80	ET263	2.50
ET262	2.50	ET261	2.50	ET260	2.50
ET150	2.80	ET146	2.50	79PS11	2.00
79PG9	3.00	79MD9	2.80	ET606	3.00
ET573	2.80	ET577	2.80	ET473	3.50
79QM9	3.00	79PS10	2.80	79Rt8	2.80
79RR8	4.20	79SF10	2.50	79AL9abc	4.20
79BT9	2.60	79TT7	2.60	79W9	2.80
79AC9	3.50	79SF9	2.60	ET731	3.00
ET576	4.20	ET574	2.80	ET575	2.20
ET730	3.50	ET814	2.80	ET725	3.50
ET252	3.00	79SR8	2.80	79TRF5	2.50
79WF8	3.20	79UT8	3.00	79M8	2.80
79PS6	2.80	79FR6	3.50	ET148	2.50
ET451	2.50	ET472	3.00	ET724	2.20
6,800	8.50	79CL7	4.80	79KB7	2.80
79UPS6	2.50	79SA5	8.00	ET651	4.50
ET144	3.50	ET254	2.50	ET471	5.50
79R05	3.00	79EQ2C	2.50	79EQ2B	4.00
77EQ2A	3.50	ET249	—		2.50
	—	ET249	—	ET594	2.50
ET320	2.20	ET253	—	ET470	3.20
ET595	2.80	7905		79A3	3.00
491	4.50	559	3.80	721	3.00
79PS3	2.60	78SE3	4.00	79PB2	3.20
79P1B	280	79P1A	2.80	78C1B	2.80
79C1A	3.00	558	2.50	557	3.00
142B	4.00	142A	8.00	79UP1	5.00
79S1	4.50	79W3	2.60	79CL1	2.60
791T2	5.00	78SB12	3.00	78S12B	2.20
78S12A	5.50	781M12	3.00	78UP10	7.00
78N10	2.60	78C11	3.10	78DT10D	2.00
78DT10C	2.50	78DT10B	2.80	78DT10A	6.50
ET813	3.50	ET143	2.80	ET141	4.20
ET812	2.80	ET593	3.20	ET490	2.80
ET556	6.00	78DB11	2.80	78UP9	6.00
78BBd9	3.50	555	4.00	650C	2.60
650B	2.60	650A	4.00	138	3.80
718	2.60	553	3.00	811	3.30
590B	8.00	590A	8.00	78MC10	4.00
78E09	2.50	ET605	7.00	ET391B	2.50
ET391A	2.50	ET551	3.00	ET641	ON/AP
ET591C	2.20	ET550	2.80	ET592	4.50
78UT9	16.00	78MX9	3.30	78T9	2.30
78UM8	2.60	78CL8	3.00	ET638B	3.00
ET638A	4.00	ET248	2.30	ET318	7.00
ET591	4.00	ET810	2.80	78TM8	2.80
78TSC7	2.50	78PT7	2.50	78VBG7	3.50
ET137B	2.80	ET137A	3.50	ET139	2.50
ET717	3.50	ET587	7.00	ET640	16.50
78F6B	3.50	78N	2.80	78A06	2.80
246	4.00	489B	2.50	489A	2.80
78CD4	2.60	78PS5	2.50	78C5	3.20
78UP5	5.00	ET140D	4.00	ET140A	14.00
ET1140P	5.50	ET136	2.50	ET487B	7.50
ET487A	750	ET588 20	10.00	78NG4	3.00
78UT4	4.00	78EK3	3.30	78T3	3.60
78B2	3.00	781A2	2.60	ET450B	2.60
ET450A	2.80	ET716	4.00	ET715	3.00
ET486	3.20	ET245	2.50	78C2	3.00
78AF2	3.00	78S3	2.60	78CF1	2.80
77CB12	2.60	77PH12	2.60	77PM12	3.50
ET135	3.00	ET586	2.80	77MX11	2.50
775C11	3.80	77PS11	2.50	77UP6A	3.00
77MX11	2.50			77PS11	2.50
ET604	2.50	ET585T/R	3.00	ET635	2.80
ET713	3.00	ASC11	2.80	77UP11	6.50
77TS9	3.00	ET603	3.00	ET583	2.50

ALL SILICON 30/60w PA PORT AMP

6½"W x 8½"D x 3¼"H 12 — 16V. two inputs 5 & 100mV. 125, 250, 500 ohm output only. No. 763A **$70 ea.** 240V operation **$33 extra.** Freight collect.

COILS and IF's All **$2.50 ea** plus post 60c
¾"W x ¾"D x 2"H

MAIL cheque or money order
(add postage) direct to —

RCS radio pty ltd

651 FOREST RD BEXLEY
NSW 2207 587 3491

HEAT SINKS

Clip and Save

Clip-on Thermalloy "Slip Clip" heat sinks and save assembly time, board space, and heat sinks costs. They require no mounting hardware, PC board drilling, or adhesives, and clamp firmly to the device for maximum heat transfer. "Slip Clips" are available for TO-202, TO-220, TO-126, Motorola case 90 and most other popular case styles.

Plastic Power Coolers

New low profile heat sinks save board space

The 6073B requires only 750" board space and is just 375" tall – the right heat sink for 500" centreline PC board applications. Cools SCR's and transistors in TO-220. Motorola Case 70 and Case 90 packages. Dissipates 21°C/watt in natural convection. Available in Black Anodized and Pre-Black Anodized finish.

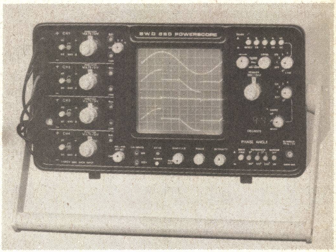
Thermalloy

Number one in Semiconductor Accessories.
TECHNICAL INFORMATION AVAILABLE ON REQUEST.

SOANAR GROUP
SOANAR
Soanar Electronics Pty Ltd
A member of the A & R Soanar Electronics Group
30 Lexton Road, Box Hill, Vic., 3128. Australia

SALES OFFICES
VICTORIA: 89 0661
N.S.W.: 789 6733
STH. AUST.: 51 6981
QUEENSLAND: 52 5421
WEST. AUST.: 381 9522

New Products



HIGH VOLTAGE OSCILLOSCOPE

A new oscilloscope from BWD Electronics, the 880 Powerscope, can measure signal levels of 100mV to 600V RMS across circuit components that are directly connected to three phase powerlines. DC measurements can be made to ±500V, and accessories are provided to extend this range to ±2kV or 1.5kV RMS. Bandwidth is from DC to 7.5MHz, and timebase ranges from 100ns to 100 seconds are provided, with triggering extending from DC to 10MHz.

A unique feature of the Powerscope is its ability to provide the user with a digital readout of phase angle between a zero crossover reference marker and a variable marker. The variable marker can be adjusted from 0° to 359° in 1° steps, and can be repositioned in multiples of 60° to provide immediate phase angle relationships in two, three or six phase systems. Four channels facilitate measurements in three phase supplies, revealing detailed performance of thyristors, triacs and ignitrons under actual operational conditions.

The oscilloscope is provided with a completely insulated cabinet, which has been tested to withstand over 5kV. The heavy duty probes are shrouded and will withstand transients up to 3kV. The instrument can be operated either from the mains, from a 20-30V DC source or from a rechargeable battery pack.

BWD Electronics recently won a Design Award from the Australian Indstrial Design Council for the Powerscope. The award was presented on the basis of originality in design concept and for the high degree of safety the instrument provides when used to test and measure circuits associated with powerline equipment and high voltage supplies.

Enquiries to BWD Electronics Pty Ltd, Miles St, Mulgrave, Vic 3170.

EXTRA HEAVY DUTY BATTERIES

Eveready has introduced a new range of "extra-heavy-duty" dry cells, the 1200 series — or black label — zinc chloride battery, designed to give longer life in appliances with medium to heavy power consumption.

With a totally new battery design incorporating a zinc chloride energy compound and special sealing techniques, the "Eveready" black label series is designed to provide more life than the "Eveready" red label series, at a lower price than the top of the range Gold Alkaline Powercells. The black label batteries are available in the standard 1.5V sizes and in a 9V version.

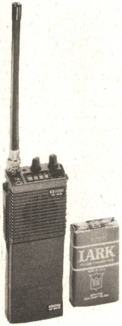
"SNAPAK" MAGNETIC CIRCUIT BREAKERS

Philips Electronic Components and Materials has added the T11 or Snapak series to the range of Airpax magnetic circuit breakers now available.

The T11 can be easily mounted in any panel, requiring only a 12mm round hole, and can be used with either AC or DC supply systems.

The patented snap-action of the mechanism increases operational life and also eliminates operator "teasing" of the contacts, minimising arcing. The current range for the T11 is from 10mA to 20A at 32V DC or 10mA to 7.5A at 250VAC. The T11 can be supplied with different types of actuator, a choice of six colours and a variety of mounting hardware!

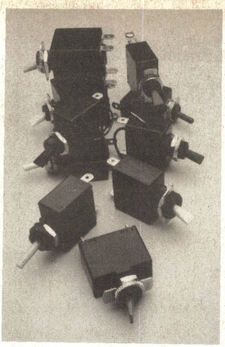
For further information contact Phillips Electronic Components and Materials, PO Box 50, Lane Cove, NSW 2066.



1.2V REFERENCE DIODE

National Semiconductor has developed a new series of 1.2V voltage reference diodes, designated the LM185/285/385 series, with excellent long term stability and extremely low noise. The new diodes feature extremely wide operating current limits, from 10 microamps to 20mA, with virtually no change in performance. They are particularly useful in battery powered applications, where the combination of low voltage and low power drain (12 microwatts) extends battery life.

Applications for the LM185 include voltmeters, regulators, and cold junction compensation circuits for thermocouples. Further information can be obtained from N.S. Electronics, PO Box 89, Bayswater, Vic 3253.



NEW 2M TRANSCEIVERS

Icom of Japan has added two new transceivers to its range of communications equipment.

The IC2A is a 1.5W 800 channel handheld transceiver which is powered by a snap on/off NiCad battery pack of three optional sizes. It is smaller than most other handheld transceivers and has been kept simply by eliminating digital frequency readout and by using a thumbwheel switch to change frequencies instead of the touch-tone pad found on other Icom units.

The second unit, the IC260A, is a new mobile SSB/FM/CW transceiver which includes a scanner, twin VFOs, CW break-in and a CW monitor. The 10W unit is sold complete with mobile mount, DC leads and microphone.

Icom is represented in Australia by Vicom International Pty Ltd, 68 Eastern Rd, South Melbourne, Vic 3205.

See us at the Sydney Computer Show.

DATASOFT

MICROCOMPUTER SOFTWARE
Proudly present the largest range of software in the world for the **COMMODORE MICRO COMPUTER.**

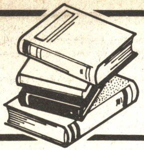
"PETSOFT"

Over 200 programs Including:- Over 40 Business Programs Over 65 Programming Aids & Tutorial Programs. Over 60 Simulations and Games Programs.

- **Both cassette and disc based programs available.**
- **No hassle guarantee - if our programs don't load, we will replace free of charge.**
- **Write or phone now for our fabulous free catalogue.**

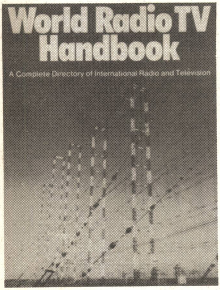
DATASOFT

139 Guildford Road,
MAYLANDS W.A. 6051.
Tel: **(09) 271 7169**
Agents required all States.



Books & Literature

World radio & television handbook



WORLD RADIO & TELEVISION HANDBOOK 1980 34th Edition by Jens Frost, Copenhagen, Denmark. Soft cover, 584 pages, Published by World Radio & Television Handbook Company.

The World Radio & Television Handbook has come to be regarded as the only complete reference of radio and television world-wide. The 1980 edition continues to fulfil this task with the massive amount of information contained in its pages and is of tremendous value to the radio listener, broadcaster and the radio industry in general.

There is a considerable increase in information concerning the medium-wave frequencies which took place during the change the 9kHz separation in 1978. The usual listing of stations in geographical order by countries and continents, with complete details of every radio station is given. There is also the frequency reference at the end of the book which includes a complete run-down of the world's medium and shortwave stations by frequency. An added interest to the book this year is the section called "Listen to the world" and this covers interesting articles on various aspects of radio listening and broadcasting in general.

A new feature which is sure to please many readers, is the review of the present world market of high class radio receivers. In this review, Lawrence Magne takes a very critical look at the receivers on the market and a comparison is given. This makes an excellent buyers' guide for any listener who wishes to purchase a new receiver.

The World Radio & Television Handbook is available in Australia and New Zealand through technical book stores, and in New Zealand from the Sole Agent, Arthur Cushen, 212 Earn Street, Invercargill.

TV & FM Aerial Installations

TV & FM AERIAL INSTALLATIONS For Australian Conditions, by W. McManus. Stiff paper covers, 80 pages 240mm x 180mm, freely illustrated by pictures and diagrams. Published by Hi-Q Aerials, 69 Maitland Rd, Islington, NSW 2296. Phone (049) 61 5317. Price $4.50 plus postage.

The name Hi-Q is well known in the context of antennas, and Managing Director Bill McManus has now turned author to produce a book which should be most useful for all potential installers of High-Q TV and FM antennas, whether it be at a do-it-yourself level or otherwise.

After a general introduction to the VHF signal behaviour, the text covers various types and antennas and feedlines, with practical hints on installation and testing. Small antennas receive due mention but more space is given to large-scale and fringe installations, involving preamplifiers, distribution amplifiers, stacking, towers, telescopic masting and so on.

There is a chapter on interference problems and others on specialised subjects such as signal splitters, caravan antennas, ultra-fringe reception, rhombic arrays, problems of deterioration, repeater stations, UHF TV, satellite reception, etc.

The book is written for Australian conditions and, while it does not get involved in antenna design, it certainly covers well the question of how best to use over-the-counter products. A useful book indeed. Our copy came direct from the Author at the above address. (W.N.W.)

COUNTER DRIVER AND NUMERAL DISPLAY PROJECTS. By F. G. Rayner, TEng (CEI), Assoc. IERE. Published 1980 by Bernard Babani Pub. Ltd, London. Stiff paper covers, 92 pages, 180mm x 109mm, illustrated by diagrams. Price in Australia $5.25.

It does not say so but I would not be surprised to find that this book had been compiled from a series presented somewhere by well known technical writer F. G. Rayer. It is certainly very specialised in its interest.

In a mix of theory and simple hook-ups (no mechanical details) the Author works through the theory and practice of counters related to events and frequency and of binary/digital conversion. The reader is introduced to display devices (Nixie tubes and seven-segment LED displays) and to power supply arrangements to suit them. How attractive readers may find all this would depend largely on their love of circuit "fiddling" and the availability of suitable bits from regular suppliers, clearance houses or the "junkbox". I found no reference, by the way, to liquid crystal display technology.

Our review copy came from Technical Book & Magazine Company Pty Ltd, 289 Swanston St, Melbourne, 3000. (W.N.W.)

Beginners' Guide To Microprocessors And Computing

BEGINNERS GUIDE TO MICROPROCESSORS AND COMPUTING by E. F. Scott, MSc, CEng, MIERE Published 1980 by Bernard Babani, London. Stiff paper cover, 122 pages 180mm x 108mm, illustrated by diagrams. Price in Australia $5.25.

These days, articles and texts providing an introduction to computing often tend to skip lightly over binary arithmetic, machine language programming, etc, in order to concentrate on BASIC and other high level languages.

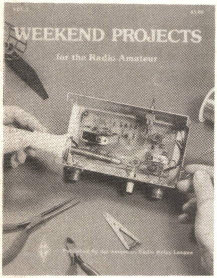
Not so this book by E. F. Scott. It spends all of 25 pages working systematically through binary, octal, hex and BCD, leading to a tabulation of ASCII and notes on data formats.

Chapter 2 covers "Basic Microprocessor and Computer Architecture". It is followed by chapter 3, with about 20 pages covering the fundamentals of programming in machine language. This, and the contents of Appendix A relate heavily to the Intel 8080 microprocessor. A useful glossary of terms and a few pages of exercises and answers complete the book.

In short, it is a book aimed at the student, working through from fundamentals, rather than at the reader who wants to gain a rapid working knowledge of a home or small business computer.

Our copy came from Technical Book & Magazine Co. Pty Ltd, 289 Swanston St, Melbourne 3000. (W.N.W.)

Amateur Radio Weekend Projects



WEEKEND PROJECTS For The Radio Amateur. Edited by Marian S. Andersen, WB1FSB for the ARRL. Stiff paper cover, 61 pages 276mm x 209mm, freely illustrated. Price in Australia to be determined.

As pointed out in the introduction, home construction of complicated amateur equipment is inhibited, these days, by various factors but a lot of fun can still be had putting together simple, supplementary projects.

A group of such projects, collected together from the pages of QST magazine is subdivided here into: Receiving — Transmitting — Test Equipment — Accessories — Power Supply (110VAC) — Miscellaneous. In all, there are just over 30 individual projects, each occupying one to two pages, and mostly with picture, circuit, and explanatory material. For example, Chapter 3 (Test Equipment) contains details of a transistor tester, oscilloscope calibrator, high-C substitution box, C&L measuring gimmick, coaxial band checker, and simple FM sweep generator.

The book could scarcely be called exciting but, if it contains just a few fun projects for the individual reader, it will have served its purpose. Our copy came from Technical Book & Magazine Co Pty Ltd, 289 Swanston St, Melbourne 3000. (W.N.W.)

BOOKS

Just some of the books from the biggest range of radio and electronics books in Australia.
If the book you require is not listed below, it can be ordered from us.

NEW — NEW — NEW

Latest editions of some of the most popular books on the subject:

ARRL Handbook 1980 Edition	$14.95
World Radio TV Handbook 1980 edition	$16.95
Radio Handbook (William Orr) 21st Edition	$26.50
The World in My Ears (A. Cushen)	$15.95
Mechanical World Electrical Year Book 1979-80	$14.25

☆ ☆ ☆

Howard Sams Books:

FM from Antenna to Audio (Leonard Feldman)	$7.00
Stereo High-Fidelity Speaker Systems (Art Zuckerman)	$8.50
TV Antennas and Signal Distribution Systems (M.J. Salvati)	$13.50
VHF Radio Propagation (J. D. Stewart)	$6.75
IC OP-AMP Cookbook (Walter C. Jung)	$17.50
TTL Cookbook (Lancaster)	$12.95
IC Converter Cookbook (Jung)	$18.95
TV Typewriter Cookbook (Lancaster)	$13.50
The Cheap Video Cookbook (Lancaster)	$7.95
CMOS Cookbook (Lancaster) 1st Edition 1977	$14.25
Active Filter Cookbook (Lancaster)	$19.95
IC Timer Cookbook (Jung)	$13.50

☆ ☆ ☆

Microcomputers/ Microprocessors Books:

Stimulating Simulations — Second Edition (C. W. Engel)	$600
Scelbi "6800" Software Gourmet Guide and Cook Book	$16.80
Scelbi "8080" Software Gourmet Guide and Cook Book	$10.00
The Future with Microelectronics (Iann Barron & Ray Curnow)	$25.00
Z-80 and 8080 Assembly Language Programming (Kathe Spracklen)	$10.00
Sargon: A Computer Chess Program (Dan & Kathe Spracklen)	$19.00
The Z-80 Microcomputer Handbook (William Barden Mr.)	$11.95
Microprocessors (R. Zaks) (Sybex)	$16.60
Microprocessor Interfacing Techniques (Lesea & Zaks) (Sybex)	$17.60
Understanding Microcomputers and Small Computer Systems (Scelbi)	$15.40
Basic Primer (Waite & Pardee)	$11.95
Basic Microprocessors and the 6800 (Ron Bishop)	$15.00
Programming the 6502 (Zaks) (Sybex)	$17.60
Programming the Z80 (Zaks) (Sybex)	$18.40
6502 Applications Book (Zaks) (Sybex)	$17.80
More Basic Computer Games (Ed. David H. Ahl)	$11.75
Basic Computer Games (Ed. David H. Ahl)	$11.75
Introduction to Microprocessors: Software, Hardware, Programming (Lance A. Leventhal) (Paper)	$17.95

Latest Adam Osborne Books:

An Introduction to Microcomputers — Volume 0 — The Beginner's Book	$11.50
An Introduction to Microcomputers — Volume 1 — Basic Concepts	$13.50
An Introduction to Microcomputers — Volume 2 — Some Real Microprocessors	$29.00
An Introduction to Microcomputers — Volume 3 — Some Real Support Devices	$19.00
Some Common Basic Programs	$13.00
Accounts Payable and Accounts Receivable	$20.80
Payroll with Cost Accounting in Basic	$18.60
General Ledger	$24.50
6800 Programming for Logic Design	$13.50
8080 Programming for Logic Design	$13.50
Z80 Programming for Logic Design	$13.50
Z80 Assembly Language Programming	$13.50
6800 Assembly Language Programming	$13.50
8080A/8085 Assembly Language Programming	$13.50
6502 Assembly Language Programming	$13.50

American Radio Relay League Publications:

Hints and Kinks for the Radio Amateur	$7.20
The Radio Amateur's VHF Manual	$7.20
A.R.R.L. Antenna Handbook	$8.80
Understanding Amateur Radio	$8.80
The Radio Amateur's License Manual	$6.20
A Course in Radio Fundamentals	$7.20
FM & Repeater for the Radio Amateur	$8.80
Single Sideband for the Radio Amateur	$7.20
Ham Radio Operating Guide	$7.20
Electronic Data Book	$7.20
Solid State Design for the Radio Amateur	$12.80
Learning to Work with Integrated Circuits	$4.00
The ARRL Antenna Anthology	$8.00
Satellite Communications	$8.80
Weekend Projects for the Radio Amateur	$6.20

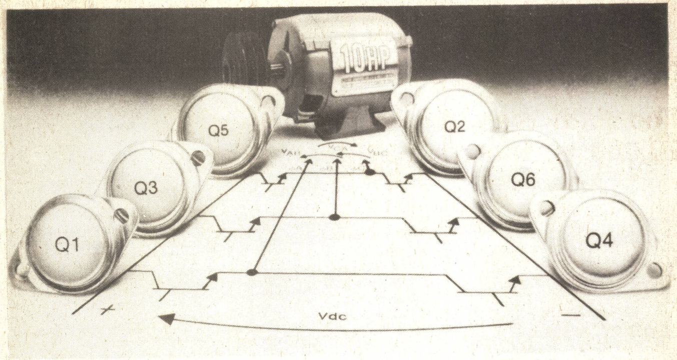
Other Titles:

Practical Solid-state Circuit Design (Jerome E. Eleksy)	$8.75
World DX Guide — 1st Edition (Ed. Jens M. Frost)	$9.95
73 Dipole and Long-wire Antennas (Edward M. Noll)	$7.50
73 Vertical, Beam and Triangle Antennas (Noll)	$7.50
VHF Handbook for Radio Amateurs (Herbert S. Brier & William I. Orr)	$9.40
Building Hi-Fi Speaker Systems (Philips)	$3.95
Beam Antenna Handbook — New 5th Edition (William I. Orr & Stuart D. Cowan)	$7.80
All About Cubical Quad Antennas — 2nd Edition (William I. Orr)	$7.00
The Radio Amateur Antenna Handbook (William I. Orr & Stuart D. Cowan)	$11.30
Audio Equipment Tests (Gordon J. King)	$18.50
The Basic Book of Ham Radio (Editors of Consumer Guide and ARRL)	$6.70
The New Penguin Dictionary of Electronics (E. C. Young)	$5.95
SCR Manual — Including Triacs and Other Thyristors 6th Edition (General Electric)	$6.00
Microelectronics: Digital and Analog Circuits and Systems (Jacob Millman) International Student Edition	$13.15
Digital Electronics (Roger L. Tokheim)	$11.70
Integrated Circuits for Electronics Technicians (Edward Pasahow)	$17.90

For Mail Orders please add: $1.00 Local $1.75 Interstate

McGILL'S AUTHORISED NEWSAGENCY PTY LTD
187 Elizabeth Street, Melbourne.
Phone: (03) 60 1475-6-7

PRICES SUBJECT TO ALTERATION



Tame brute power control costs with unbeatable SuperPower value.

			NPN		PNP		
Ic	Vceo	hfe min @ Ic	Part No.	Price 100+	Part No.	Price 100+	Case
0.5	300	30 50MA	MJE340	0.67	MJE350	0.94	Case 77
4	45	10 4 Amp	2N6121	0.38	2N6124	0.40	To.220
4	80	10 4 Amp	2N6123	0.42	2N6126	0.44	To.220
4	300	10 1 Amp	MJE13004	1.35			To.220
4	400	10 1 Amp	MJE13005	1.70			To.220
8	400	12 2.5 Amp	2N6545	2.02			To.3
8	100	1000 3 Amp	MJE6045	1.49	MJE6042	1.77	Case 90
8	150	40 2 Amp	MJE15030	1.36	MJE15031	1.36	To.220
10	600	20 5 Amp	MJ10014	7.30			To.3
10	60	25 3 Amp	MJE2801	1.09	MJE2901	1.60	Case 90
10	60	20 4 Amp	MJE3055	0.54	MJE2955	0.54	Case 90
15	60	20 4 Amp	2N3055	0.52	MJ2955	0.65	To.3
15	400	300 3 Amp	MJ10012	2.84			To.3
15	400	12 5 Amp	2N6547	4.56			To.3
16	100	1000 10 Amp	MJ4035	4.08	MJ4032	4.72	To.3
20	140	25 5 Amp	MJ15003	2.50	MJ15004	2.50	To.3
30	100	25 7.5 Amp	MJ802	2.19	MJ4502	2.19	To.3
50	400	25 20 Amp	MJ10015	13.86			To.3

It's rough shelling out $20 to $30 for 30-50 A power transistors that can turn the most practical design into a cost-overrun nightmare.

We've found a way to help you beat those high costs – SuperPower transistors with SuperPower value. The broadest line of high-power devices at the lowest-cost-per-ampere of any in the industry.

Our introduction of the Switchmode concept four years ago proved it to be the overwhelming low cost favourite of designers everywhere for switching power supplies and power control applications. Each and every Switchmode device is specifically designed and characterized for those applications with solid, practical data from a pragmatic source...the Designers data sheet. You're way ahead from the start.

Expect more from the SuperPower for your next high-power design. And pay less for it.

All prices exclude sales tax
and subject to change
without notice.

CEMA

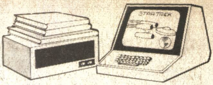
CEMA ELECTRONICS PTY. LTD.

ADELAIDE	170 Sturt Street, Adelaide, S.A. 51 6483
BRISBANE	22 Ross Street, Newstead, Qld 52 4261
MELBOURNE	208 Whitehorse Road, Blackburn, Vic 877 5311
PERTH	Unit 1, 25 Brisbane Street, East Perth 328 8091
SYDNEY	21 Chandos Street, St. Leonards 439 8622
NEW ZEALAND	7-9 Kirk Street, Grey Lynn, Auckland 76 1169 World Trade Centre Building, Wellington 848 922

Agents: CANBERRA Ortex (062) 82 4995 WOLLONGONG Macelec (042) 29 1455 NEW GUINEA Daltron Electronics, Boroko 256616

New agent in HOBART – D&I Agencies 002 232842

Microcomputer News & Products



The Fifth West Coast Computer Fair — 20,000 visitors and 272 exhibitors

The Fifth West Coast Computer Fair was held in San Francisco in March, attracting some 20,000 visitors and 272 exhibitors. Former EA Editor Jim Rowe (now Technical Director of Dick Smith Electronics) was able to visit the Fair, and sent us the following report.

The weekend of March 15-16 was quite a busy one in San Francisco this year. The annual St Patrick's Day Parade was held on the Sunday, and attracted tens of thousands of people from all over California. But there were a lot of other people in town with only marginal interest in the Parade: Thousands of computer enthusiasts of all ages, there to visit the Fifth West Coast Computer Fair.

This year the Fair was so big it had to be housed in two large halls — the Civic Centre Auditorium on street level, and the even larger Brooks Hall which is built underneath the park across the road. The two are connected by means of escalators, stairs and an underground walkway.

Between them, the two auditoriums housed no less than 272 exhibitors — making the Fair about four or five times larger than the largest computer show so far held in Australia.

Of course, not all of the stands were large — many were little more than a sign and a portable counter, with a person demonstrating a small item of hardware or software. But quite a few of the exhibitors were large firms like Tandy/Radio Shack, Heath, 3M, Exidy, Micropolis and Philips, with quite elaborate stands.

In addition to the exhibition, the Fair also provided a continuous program of lectures and seminars, held in meeting halls around the Civic Auditorium. Some of the lectures were by well-known names such as Carl Helmers, Adam Osborne, David Ahl and Paul Terrell. Many visitors visited the Fair on all three days that it was open, in order to catch as many of the lectures and seminars as they could.

The Quality Software stand. American teenagers were only too eager to demonstrate their computer prowess to anyone who showed interest in them or the equipment.

Touring the hundreds of display stands was a little like a visit to the Royal Easter Show in Sydney — it was almost a matter of "wading" through a sea of humanity. The only real differences were that the people concerned chewed gum more than Australians and spoke with markedly different accents! There were the usual precocious youngsters seated at almost every available keyboard, eager to demonstrate their facility with computers to anyone who showed interest in either them or the equipment — and often preventing more serious visitors from getting near. And there were lots of "computer freak" type people — with long hair, beards, weird clothes, and apparently incapable of speaking about anything other than floppy disc operating systems, hard disk protocol and the comparative features of various BASIC interpreters and computers!

Lots of people were wearing tee-shirts emblazened with various computer-related mottos like "GARBAGE IN — GARBAGE OUT" and "BYTE ME". I also spotted a very well-endowed and obviously liberated young woman whose tee-shirt displayed the redundant message "DUAL FLOPPYS"!

Quite a few of the US computer publications had stands: Byte, Interface Age, Personal Computing, Creative Computing, Dr Dobb's Journal, Computerworld and a number of the smaller publications specialising in the Tandy TRS-80 computer. I also came upon a relative new publication called Infoworld, and recognised a familiar face on its stand — John Craig, formerly Editor of Kilobaud and Creative Computing. It was a pleasure to meet John again, and to learn that he is now publishing this new paper. He explained that it is a fortnightly paper specialising in microcomputers, peripherals and software — and that he hopes it will be sold in Australia as well as in the USA.

While walking around the stands i spotted a rather eccentric-looking bearded individual, moving around the aisles on roller skates. This turned out to be the organiser of the Fair, Mr Jim Warren. I don't know whether he was simply a roller skating enthusiast or had

SYN-1 Single Board Computer . $210.00

KTM-2 CRT/TV Keyboard terminal module $349.00

BAS-1 8K BASIC ROM for SYN-1 . $149.00

BUFFERED MOTHERboard for SYN-1, KIM-1 or AIM-65 systems . . $179.00

16K-8 fully tested memory board WRITE PROTECT and BANK switching for SYN-1, KIM-1 or AIM-65 systems . . $360.00

EPROM Programmer and EPROM/ROM Board MEMORY mapped EPROM programming will program up to 16K per command firmware in PROM included. For SYN-1, KIM-1 or AIM-65 systems $345.00

2114 Memories $5.70

AUTOMATIC TELEPHONE DIALER PROM dialling 32 numbers plus other options . $180.00

PRESETABLE COUNTER 5 digits suitable for counting, batching and numerical control $150.00

DIGITAL TACHOMETER $120.00

STEPPING MOTORS wide range for N.C. Control, Plotters, Variable speed, Servo Control etc. From . $49.50

HAND HELD TACHOMETER $180

STEPPING MOTOR DRIVING CIRCUITS for 3 or 4 phase in Mode 1 phase 2 phase 1-2 phase excitation. From $12.00

THUMB WHEEL SWITCHES — $2.20ea.

TROXINITY TRANSDUCERS — $15.00ea.

TACHO GENERATORS From $30

Mail orders add $3.50 for postage and packaging

G.C.S.

67 Blackshaw Avenue,
MORTDALE 2223.
Telephone: 570 1225

(Trade enquiries invited)

OVERCROWDED — View inside the first hall of San Francisco's Computer Fair. The Fair attracted 20,000 people and no less than 272 exhibitors!

chosen to use the skates as an efficient means of transport, but it was certainly different!

With so many stands and attendees, the Fair was certainly impressive, although to the visitor with a reasonably up-to-date background in small computers there were few really new products or surprises. Mostly there were the products and services made familiar by advertisements in the journals. However a few new products did attract my attention.

One was the "ScanVertiser", a LED-matrix dynamic display panel designed for applications such as in-store advertising, message readout, and as an information board. In fact it is almost identical in function to the annunciator displays on the San Francisco BART subway, used to display everything from train destinations to the time, news flashes and commercials. The ScanVertiser panel comes with a character height of either 50 or 100mm and has a memory capable of storing messages of up to 1024 characters in length. Even with the 50mm high characters the messages are clearly readable for up to about 35 metres. A number of panels can be remotely programmed from a single keyboard.

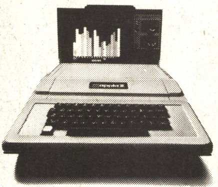
Another item which caught my attention was the new Xymec Hy-Q 1000 electronic printer terminal. This is basically a custom conversion of an Olivetti daisy-wheel typewriter, with additional electronics based on a Z-80 microprocessor. The final product represents a very attractively priced daisy-wheel printer for microcomputers — yet is also capable of being used off-line as a normal electric typewriter.

On the Lobo Drives stand I came across a new expansion interface for the Tandy TRS-80 computer. Built by Lobo and called the LX80, the new interface is designed to provide a TRS-80 with greatly improved performance and reliability. It has provision for an optional 32K of RAM, up to 4K of optional ROM or PROM, a Centronics printer port and two optional RS-232 serial ports. It also has a magnetic disk controller which will support up to four drives — and the drives may be almost any combination of 133mm mini-floppies, 200mm floppies or 200mm hard disks of the Winchester type; ports are provided for all three types. The LX80 comes in a sturdy metal case and also has a further port for either continued expansion or the connection of a screen printer.

Exatron Corporation had quite a large stand displaying their "Stringy Floppy" device — a low cost data storage peripheral based on a tiny "wafer" cassette with an endless loop of magnetic tape. This is now available in an RS-232 serial interfacing version as well as versions to suit the TRS-80, SWTP and S-100 systems. The S-100 version has software-controlled dual density, recording at either 14,400 baud for maximum capacity and speed, or 7200 baud for maximum reliability and compatibility with other systems. At the higher rate, a wafer with a 10-foot loop of tape will save or load 16K bytes of data or program in 12 seconds. The unit comes complete with a controller, which includes a 2K monitor program in ROM to handle tape driver functions.

About the only other thing I noted about the Fair was the growing number of remote access data base services now available to the personal computer user. Among those I spotted were Telecomputing Corp of America, who

APPLE II/APPLE II PLUS COMPUTERS come complete with 12K ROM, Cassette Interface, 8-port I/O facilities, tutorial manual, language reference manual, system and hardware reference manual, introductory software manual, leads, connectors, games paddles and introductory software.



APPLE II PLUS 16K RAM . . . $1395.00*
APPLE II PLUS 32K RAM . . . $1503.00*
APPLE II PLUS 48K RAM . . . $1611.00*

There's never been a better time to buy an Apple® II.

apple pascal

The lowest priced, highest powered Pascal system on the market.

Our high-level, full feature Language System consists of a plug-in 16K RAM language card, five diskettes containing Pascal as well as Integer BASIC and Applesoft extended BASIC, plus seven manuals documenting the three languages.

The beauty of this Language System is that it speeds up execution and helps cut unwieldy software development jobs down to size. Also, because the languages are on diskette, loaded into RAM, you can quickly and economically take advantage of upgrades and new languages as they're introduced.

Apple's Pascal language takes full advantage of Apple high resolution and colour graphics, analog input and sound generation capabilities. It turns the Apple into the lowest priced, highest powered Pascal system on the market. With Pascal, programs can be written, debugged and executed in just one-third the time required for equivalent BASIC programs. With just one-third the memory.

On top of that, Pascal is easy to understand, elegant and able to handle advanced applications. It allows one programmer to pick up where another left off with minimal chance of foul up.

Because Apple uses UCSD Pascal,™ you get a complete software system: Editor, Assembler, Compiler, and File Handler. And because we adhere to the standard, your programs run on any UCSD Pascal system with minimum conversion. Which is really something an enthusiast can get enthusiastic about.

apple computer

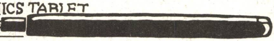
Apple Language System **NOW AVAILABLE @ ONLY $495.00***

Requires 48K Apple II Computer and Disk II & Controller.

The GRAPHICS TABLET is an image input device to enter pictorial information directly into the Apple II Computer. eg from:

- maps and photographs
- logic diagrams and schematics
- histograms
- architectural drawings – fine art

THE GRAPHICS TABLET
THE GRAPHICS TABLET
THE GRAPHICS TABLET
THE GRAPHICS TABLET
THE GRAPHICS TABLET
THE GRAPHICS TABLET
THE GRAI



Powerful software provides comprehensive set of functions selected with stylus from menu. Graphics Tablet complete with manual, interface and software . . . **Only $874.00***

Send now for our latest free book catalogue

Now over 150 editions available: Byte Books, Compusoft, dilithium Press, Hayden, Matrix, McGraw Hill, Osbourne, Prentice Hall, Howard W. Sams, Scelbi, Sybex, University Software.

FOR FURTHER DETAILS AND INFORMATION WRITE OR CALL US

ComputerLand® in Melbourne

Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.

*Prices do not include Sales Tax

Prices are correct as at time of publication and may be subject to change.

if TRS-80's were meant to have disks they'd be built in

I soon found out that cassettes were slow and not very reliable. So I thought I needed disks. Then I heard about STRINGY FLOPPY^{tm}. The reliability of disks AND 14 times faster than cassette. A miniature digital tape transport completely under the control of the computer, recording on a tape "wafer" the size of a credit card (and not much thicker). My TRS-80 performs like a real computer at a fraction the cost of disks.

ASP's brochure explains it all, and versions for other computers are on the way.

NOTE: - SELECTRIC is a trademark of IBM
- TRS-80 is a trademark of Tandy

ASP MICROCOMPUTERS

Telephone:
2118855 2118344
799 DANDENONG ROAD.
EAST MALVERN 3145.
VICTORIA AUSTRALIA.

Try This New Card Trick

Shuffle a lot of cards. (Use PP or other Exorciser* compatible cards.)

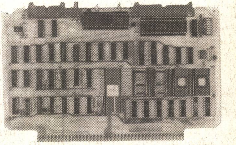
Scatter them anywhere on the bus (within 256K).

Add the new PP 6809 Card.

And without touching a single switch, present any arrangement you like to the microprocessor. That's what you get with PP's new 6809 based single card computer with Memory Management.

If you do a lot of development work with Motorola Exorciser* Bus Systems — suffer from "Card-Swapping Syndrome" — find fiddling on-card address switches frustrating — need to be protected from other multiusers — require a full 64K of contiguous programming space free from I/O or monitors — feel ready for a flexible modular system — or perhaps just want the exhilaration of working with the leading 8-bit microcomputer. Then you need to contact PP.

- 6809 processor based.
- PP's own special monitor.
- 256K Memory Addressing.
- Software controlled write protection.
- Sockets for 8K 2716 PROM.
- 1K RAM.
- RS-232 Interface with software controlled baud rates.
- PIA with dual timers.
- DMA cycle steal logic.
- Dynamic and slow memory handling.
- LED Status indicators.
- 3-State LS buttered bus.
- Exorciser* bus compatible gold plated edge connector.
- Double-sided, plated-through holes full solder mask.



*Exorciser is a registered trade mark of Motorola Inc.

Call us or send a stamped SAE for further details.

PP Pennywise Peripherals
Pennywise Peripherals

19 Suemar Street, Mulgrave, Vic. 3170.
Phone: (03) 546 0308.
NSW Dealer Microbits, Sydney (02) 89 3145

Microcomputer News & Products

Computer Fair ... ctd

run "The Source" service, and MicroNET. Both systems are making available an increasingly powerful set of data base and information services for the personal and small business system user. This is not only good news for the users themselves, but also good news for the firms who make and market modems and acoustic couplers — because every user needs such a device to enable his computer to talk to the services!

All in all then, the Fifth West Coast Computer Fair was not the scene of many dramatic unveilings of exciting new products. There were a few, but mainly the Fair seemed to reflect a period of consolidation in the personal computer industry. Most people I talked to seemed to think that the next unveiling of new products was most likely to take place at this year's National Computer Conference (NCC), planned to take place in Anaheim in late May.

New computer store opens in Sydney

A new Microcomputer store, Microbits, has opened in Sydney, with the full range of Pennywise Peripherals products available. In addition to these, Microbits also stock complete systems and system components.

The proprieter is Theo Beernsterboer and the store is located at 280 Victoria Road, Gladesville, 2111. Telephone: (02) 89 3145.

Low-cost development system from Synertek

Royel Micro Systems Pty Ltd, Australian distributors of Synertek microprocessor systems and components, have announced the availability of a new microprocessor development system, the MTD1000.

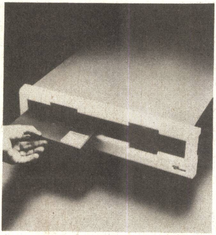
This low cost system has an impressive list of desirable features, such as a resident Assembler/Editor which produces relocatable code to be executed directly or burned into EPROMS. A dual cassette interface allows assembling large programs using cassette to RAM as source entry, and cassette or RAM for object output.

To allow maximum flexibility and to allow easy expansion, the circuit cards are all Exorciser compatible. The motherboard has two sockets installed plus space for two more. For further expansion the motherboard itself is Exorciser bus-compatible and may be installed in a card cage. This allows the user to access the EPROM programmer, dual cassette interface, parallel printer interface, and debug hardware in an expanded system.

The unit comes complete with a 54-key keyboard with case and 30cm monitor.

Further details from Royel Micro Systems Pty Ltd, 27 Normanby Road, Notting Hill, Vic., 3168. Phone (03) 543 5122.

New double density disc system from Data Systems Design



A new double sided, DEC compatible floppy disk system, the first to be compatible with all DEC and IBM diskette formats, was introduced recently by Anderson Digital Equipment Pty Ltd, agents for Data Systems Design.

According to Bill Anderson, Managing Director, the DSD 480 system reads and writes on both sides of industry-standard 200mm diskettes for a formatted capacity of 1M-byte per diskette, or 2M-bytes of on-line storage.

The system is hardware, software, and media-compatible with DEC LSI-11 and PDP-11 computers and doubles the capacity of other DEC-compatible floppy disk systems.

According to ADE, the DSD 480 will find two major applications: "the DSD 480 is particularly useful for those people who find that 1M-byte of on-line storage is insufficient, and must increase their capacity at minimal cost. The 480 also provides the attractive and inexpensive method of interchanging data and program between DEC and IBM systems."

Priced at $4964, the DSD 480 is available for delivery 40 to 55 days after receipt of order. OEM discounts are available for quantity orders.

For further information contact: Anderson Digital Equipment Pty Ltd, PO Box 322, Mt Waverley, Vic 3149.

LOOKY VIDEO

O.S.I. (OHIO) EXPANSION BOARDS

New, locally made 8K RAM — each
Daisy Chain to 40 K.
Complete — Board, Buffers,
Filters, 40 pin I/O Sockets
No 2114 RAMS
Expand in 1K or 8K Blocks.
Assembled and tested $135.00
Kit $120.00

INTRODUCTORY OFFER FREE 40 PIN LEAD NORMALLY $19.95

O.S.I. SOFTWARE
See previous 2 issues of EA.
Note: 1. All tapes have two copies of the programme — one on each side.
2. Printed LISTING is also included.
3. Super Utility has U1-3, not U1-4 as previously advised.

VIDEO TAPES — UHS — 3HR
$24.00 cheaper in 5, or 10 lots.
FAIRCHILD GAMES — $149.00 with 8 Free Cartridges
Mail Order: P&P $1.00 for 1 or 2; $1.50 for 3-5, $2.00 for 6-9; $2.50 for 10 or more

LOOKY VIDEO
PO Box 347 Richmond Vic. 3121
Shop: 418 Bridge Rd, Richmond Vic.
Ph. (03) 429 5674

NOW RENTING!
by

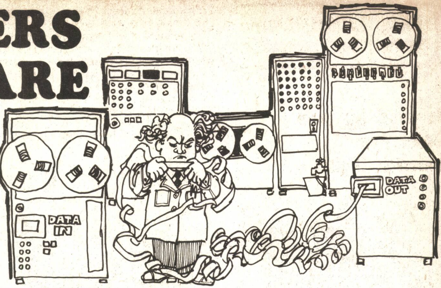
DORF MICROCOMPUTER

SHORT
MEDIUM OR
LONG TERM
ORDERS ARE BEING
TAKEN FOR SOME OF
THE MORE POPULAR
MICROCOMPUTERS ON
THE MARKET

DORF CAN DELIVER, SET UP AND GET YOU GOING

Phone: (02) 233 3555

COMPUTERS STILL SCARE YOU?



HOW ABOUT THIS?

Computers have come a long way . . .

Gone are the days when they occupied a large room and needed an electronics degree to operate. Gone are the days when all they did was play games.

Today's small business computer occupies a tiny desk top, and can be used by virtually anyone. It can handle your business accounts, keep track of stock movements, store valuable records & data, control repetitive processes . . . all this and much, much more; faster and more efficiently than you're doing it at present.

It can also give your secretary new skills in 'Word Processing' – the latest development in efficient office communications.

And this is just the beginning! New programs, new uses are being developed all the time. And the good news is the computer you buy today won't be obsolete tomorrow: you can use these new programs in your existing computer.

A small business needs a computer just as much as a large business. You will find it one of the best investments you ever made. Why not give it a go?

A business computer doesn't cost: it pays!

INTRODUCING: The SORCERER Business Computer System

SORCERER COMPUTER

Powerful 16k memory (expandable to 48k within machine), with standard 'typewriter' keyboard & numeric keypad. S-100 bus compatible, comes complete with 8K standard BASIC cartridge. Standard RS232C input/output interfacing.

Cat X-3001 . . . . **$1395.00**

VIDEO MONITOR

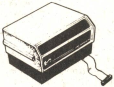
Computer plugs straight in – no messy interfaces. Approx. 30cm screen, holds up to a page of double spaced typing. **Cat X-1196** **$149.50**

CASSETTE RECORDER (not illustrated)

An economical way to store data. Connects directly to computer; record and play back. Quality 'National' brand.

Cat A-4095 . . . . **$79.95**

S-100 EXPANSION SYSTEM:



Allows use of disk storage (see right) plus input & output devices made by hundreds of manufacturers. (S-100 bus is a world standard system of computer interfacing).

Cat X-3010. . . . . **$499.00**

TERMS/LEASING AVAILABLE TO APPROVED APPLICANTS. JUST ASK!

BUSINESS PROGRAMS:

At last! 3 different programs on diskette to help your business. These have been examined by leading accountants and their verdict was 'excellent!'

'Microledger' – Chart of accounts, journal, trial balance, posting, audit trail of transactions, profit and loss statement and balance sheet. Cat X-3700

'MICROPAY' Accounts payable. Statements by vendor and by date. Cash requirements. Prints cheque & mailing stub. Journalizes A/P transaction into MICROLEDGER. Cat X-3702

'MICROREC' Accounts receivable. Aged trial balances. Prints invoices. Statements by customer and by date. Cash projections. Journalizes A/P trans. into Microledger. Cat X-3704

Each program (on disk) $169

You will also need:

Disk-drive system (programs are on disk). For serious business usage, disks give much more storage, are much faster and are more reliable than cassettes. **Cat X-3205 $1350.00**

WORD PROCESSOR PAC™

The Word Processor Pac™ looks like an 8-track cartridge. It simply plugs into the Sorcerer and converts it into a very powerful word processor. All you add is a printer! Full text manipulation & editing, gives features of W/P units costing two & three times the price!

Word Processor Pac & Manual (Cat X-3085) $275

You will also need a printer:

Itoh 8300P Matrix Printer: For general invoicing, reports, etc, this printer is the most economical around! Uses standard (and cheap!) fan-form stationery. Cat X-3255 **$970.00**

Daisy-Wheel Word Processor Printer:

When you must have the best, this is it! Takes ordinary bond paper, incredibly clear, clean and sharp print from interchangable daisy-wheel. Quality, speed & reliability as good or better than 'golf-ball' system. Inbuilt microprocessor gives features not found on other printers. When you want the best quality print: this is it!

Cat X-3260 **$3390.00**

WANT TO KNOW MORE? See the Computer Manager at any of our stores below – or ring our head office (02 888 3200) and ask for the Computer Products Manager.

DICK SMITH ELECTRONICS

NSW	125 York Street,	SYDNEY.	Ph 290 3377
	147 Hume Highway,	CHULLORA.	Ph 642 8922
	162 Pacific Highway,	GORE HILL.	Ph 439 5311
	30 Grose Street,	PARRAMATTA	Ph 683 1133
	396 Lane Cove Rd,	NORTH RYDE	Ph 888 3200
	263 Keira Street,	WOLLONGONG.	Ph 28 3800
	613 Princes Highway,	BLAKEHURST	(Opening Soon)
VIC	399 Lonsdale Street,	MELBOURNE.	Ph 67 9834
	656 Bridge Road,	RICHMOND.	Ph 428 1614
QLD	166 Logan Road,	BURANDA.	Ph 391 6233
	842 Gympie Road,	CHERMSIDE.	Ph 59 6970
ACT	96 Gladstone Street,	FYSHWICK.	Ph 80 4944
SA	60 Wright Street,	ADELAIDE.	Ph 212 1962
WA	414 William Street,	PERTH.	Ph 328 6944

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113. Ph 888 3200. PACK & POST EXTRA.

bankcard welcome here

SHOPS OPEN 9AM to 5.30PM
(Saturday: 9am till 12 noon)
BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY

RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

Universal bar code reader from Anderson Digital

Anderson Digital Equipment Pty Ltd has just released a new bar code reader that can read up to eight popular bar codes and three code combinations. An operator can conveniently select the desired code via panel-mounted program switches on the reader manufactured by Interface Mechanisms Inc. The Model 9300 reader has a highly flexible asynchronous serial data interface. The compact unit includes an Intermec Model 1236 Ruby Wand light pen. Other wand and non-contact scanner models are available.

The Model 9300 has asynchronous serial data communication capability. Control switches are provided for transmission speed (110 to 9600 baud), four parity options, end of message, full/half duplex and block transfer. The reader has a dual RS-232-C interface for terminal and modem connection. Also, the unit can be attached to an Intermec multiplexer, allowing up to 16 readers from one RS-232 port. The Model 9300 ranges in price from $1090 to $1485 depending on the choice of Wand or Scanner.

For further information contact: Anderson Digital Equipment Pty Ltd, PO Box 322, Mt Waverley, Vic 3149.

Multi-user BASIC from Cromemco

Cromemco have just released a new Multi-User BASIC for their range of floppy disk based systems. The Multi-User BASIC will allow up to seven independent programs to be run simultaneously.

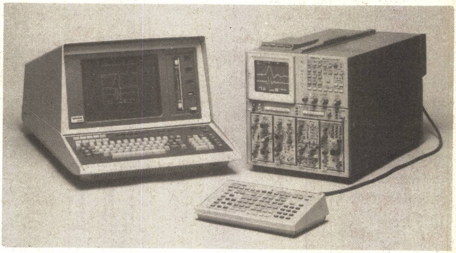
The Multi-User BASIC is supplied as a software-only or as a combination hardware/software package to upgrade Cromemco System Two or System Three to a two-user system.

To expand the system beyond two users, additional memory boards and interfaces will be required. The system comprises a time-sharing operating system, Multi-User CDOS, and an enhanced version of the Cromemco 16K extended BASIC.

Apart from the Multi-User capability of the system, there are some additional and very powerful commands included in the software package, these generally only being found on very large computer systems. One of these is a PROTECT statement which insures against unauthorised reading, writing and erasing of a file.

Further information from Informative Systems, 3 Bank Street, South Melbourne, Vic. 3205. Phone (03) 690 2284.

Tektronix signal processing system



Tektronix Australia has introduced the WP 1320 Signal Processing System, which is a combination of the 7854 Programmable Digital Storage Oscilloscope and the Tektronix Model 4052 Graphic Computing System. The 4052 is a powerful desktop computer with both stand-alone and system capability. It offers high performance, flexible data communications, easy-to-learn extended BASIC and high resolution graphics. Signal processing ROM packs have been included in the WP 1320 to tailor the system for waveform processing.

The WP 1320 system enhances the powerful capabilities of the stand-alone 7854 with additional waveform processing, graphics and data storage. Many of today's applications require a system approach which can be satisfied by the WP 1320. Important technical features

TRS-80® PET® S-100

APPLE® NORTH STAR® MEDICAL & PROFESSIONAL SYSTEMS-BUSINESS SYSTEMS

*INSTANT SOFTWARE®
OVER 900 PROGRAMS
BUSINESS-HOME-EDUCATION
SCIENCE-GAMES-HEALTH
EASY INSTRUCTIONS
PROFESSIONAL DISKS & CASSETTES
GUARANTEED QUALITY

*TESTED HARDWARE- We represent
120 Manufacturers - 800 Products
VERBATIM mini DISKS 1-9$4-25; 10up $4
*FREE SYSTEMS ANALYSIS
Send us full details of your needs
74 page Microcomputer guide $11
53 Page price list $ 6

*SEND FOR FREE CATALOGUE OF SOFTWARE - EA 8 -SPECIFY COMPUTER
*SYSTEMS - Word Processor - Money Belt - Time Keeper - Bookkeeper
ALL PRICES TAX EXEMPT-ADD 15% WHERE APPLICABLE - F.O.B. HAWTHORN VIC.
SUBJECT TO CHANGE WITHOUT NOTICE
BANKCARD-GIVE NAME NUMBER EXPIRY DATE AND SIGNATURE

MICRODOT® P.O. BOX 420 HAWTHORN 3122 AUSTRALIA 03-819 2411

WHY WE CHOSE COMMODORE

With so many Microcomputers on the market, the choice was as difficult for us as it is for you. We wanted a machine with versatility, yet capable of specialisation for individual needs and affordable. This is what we found:—

THE PET — A very versatile Personal Computer with 8K bytes of memory that can be easily updated to 40K. Ideal for education, hobbyists, small business applications, etc. This compact machine, like its bigger brothers, can be carried and used anywhere. It operates on ordinary 240V power and is easily interfaced to a variety of other equipment. The software is written in BASIC, an easy to learn and simple to program language. A large selection of software is readily available. The machine itself, has a TV screen, calculator type keyboard and integral cassette unit. The PET requires next to no servicing yet the design is remarkably simple to facilitate any repairs.

THE CBM — A choice of two machines, either 16K or 32K, again with easily upgraded memory. Both have a typewriter keyboard, 1000 character TV screen, can be attached to an external cassette unit or, for a full business system, a dual drive floppy disk and printer. The CBM is ideal for business applications. Software readily available includes a General/Debtors/Creditors Ledgers Package, a Word Processor Package with capabilities usually only found on more expensive systems, Inventory, Stock Control, Job Costing and many more are now under development. Again, the CBM can be interfaced to other equipment and is simply designed to facilitate servicing.

BUT it is impossible to tell the full story in this small space. Now to our next point.

ABOUT US

We are professional Microcomputer Systems Designers specialising in the Commodore Product range. Our technical expertise consists of more than 10 years DP experience at high levels on mainframes, minis and micros. We can design and program systems to your personal requirements and offer you full hardware support. Should you want continuous stationery, cassettes, floppy disks, we can supply them. Like our product, we are a versatile team, eager to assist you in any way we can.

BS MICROCOMP FOR

☆ SOFTWARE ☆ HARDWARE
☆ SERVICE ☆ SUPPLIES

bankcard
welcome here

MICROCOMP
MICROCOMPUTER SYSTEMS DESIGNERS

WHERE ARE WE?

Due to increased business, we have moved to larger premises at:
4th Floor,
561 Bourke Street, Melbourne, 3000.
(next to AMP building).
Please contact Telecom for our new phone number or ring 288 9129/288 9512.

THE 1980 HOME COMPUTER SHOW

- Personal Computers
- Microprocessors
- Small Business Systems
- Games and Gadgetry

Some display stands may possibly be available and all enquiries can be directed to Home Computer Show, John Kennedy Associates Pty. Ltd., 443 Little Collins Street, Melbourne 3000 (03) 67 1377 or in Sydney (02) 918 8174

Sydney: Westco Pavilion

At Sydney Showgrounds — just inside main entry gate. Plenty of car parking available on site

Thursday, May 22, 10.00 a.m.—6.00 p.m.
Friday, May 23, 10.00 a.m.—6.00 p.m.
Saturday, May 24, 10.00 a.m.—8.00 p.m.
Sunday, May 25, 10.00 a.m.—6.00 p.m.

the WP 1320 system are: extended raphics capability, program storage nd control, data storage, hard copy ocumentation, GPIB instrument conol and waveform processing.

nternational oftware directory

Australian and New Zealand industry being offered information on over 00 of the world's most sophisticated AD and production control programs vailable from independent software uppliers in Europe and the USA.

The programs are described in the ew International Directory of oftware published on February 26 by ritain's Computer Users' Year Book.

Among the organisations whose oftware products are described in the irectory are the Massachusetts Institute of Technology, the universities of Harvard and California, the NASA Research Centre, the US National Technical Information Service, the Lockheed and McDonnell Douglas corporations, the Atomic Energy Research Establishment at Harwell, the French Atomic Energy Commission, the Computer-Aided Design Centre of Cambridge, the Danish Institute of Circuit Theory and Telecommunications, the Railroad Engineering Establishment of Liechtenstein and Teckla Oy of Finland.

Systems and applications software are arranged within 107 categories, including: Communications, Compilers, Data Management, Development Aids, Systems Software for Mainframes, Systems Software for Microprocessors, Utilities, Accounting Administration, Production and Distribution, Banking, Insurance, Computer-Aided Design (CAD), Modelling, Simulation and Statistics and a section of other categories for various specialised applications software.

Cost of the directory in Australia and New Zealand is $A135.00 plus postage. It can be ordered from DP Education Pty Ltd, Roseville Chambers, 9 Hill Street, Roseville, NSW 2069.

Data-Eighty computer exhibitions

Data-Eighty computer exhibitions to e held in Sydney, Melbourne and Adelaide promise to be the most uccessful ever. Included in the long list f exhibitors are well known names as Wang, Hewlett-Packard, Digital Equipment Corp, IBM and many others.

Data-Eighty will be held in Melbourne on May 28-29 at the Southern Cross Hotel and in Sydney at Centrepoint on August 5, 6, and 7.

For further information contact Jana Pearce, National Promotions Manager, Graphic Demonstrations Pty Ltd, Suite 2, Eighth Floor, 28-36 Foveaux Street, Surry Hills, Sydney. Phone (02) 212 4199.

B.S. Microcomp moves house

B.S. Microcomp have moved to new premises on the 4th Floor, 561 Bourke Street, Melbourne, 3000. Phone numbers are not yet available but will be announced as soon as possible.

256K bubble memory from NS

Santa Clara, California — National Semiconductor has begun sampling a low-cost 256K-bit bubble memory device featuring a small die size in the industry's smallest bubble memory package.

Designated the NBM2256, the 256K-bit non-volatile magnetic domain storage device uses what is known as a dual block-replicate architecture and offers several features not offered by other bubble memory suppliers, according to Frank Stempski, marketing manager for bubble memories.

At an operating frequency of 100kHz, the NBM2256 has a data rate of 100 kilobits per second and a seven milliseconds average access time to the first bit of a random data block. The device has a typical power dissipation of about 750 milliwatts.

The NBM2256 will be complemented by associated support circuits to provide a complete subsystem solution with only five integrated circuits. The support chip family is made up of a:

- INS82851 bubble memory controller
- DS3615 function driver
- DS3616 coil driver, and
- DS3617 sense amplifier.

Using the support circuits and the NBM2256 in combination makes possible a complete bubble memory subsystem in only nine square inches of printed circuit board area, according to Stempski.

Further information from NS Electronics, PO Box 89, Bayswater, Vic 3253.

$ THE LOGIC SHOP PTY. LTD.

Discount shopping for your professional Microcomputer and terminal requirements

COMPUCOLOR II
from
$1970
(inc tax)

Ex Stock

features:
Up to 32K User RAM
Eight-colour display
32 lines of 64 char.
5" Mini Disk Drive
40 Tracks, 48 TPI

TELEVIDEO TVI-912
from
$1368
(inc tax)

Ex Stock

features:
24 lines
80 char. per line
Transmission rates 75-19,200 Bd.
96 char. ASCII Upper & Lower Case
12" Monitor

MICROLINE 80 PRINTER
from
$922
(inc tax)

Ex Stock

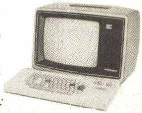
features:
80 char. per sec.
80 and 132 char. per line
9x7 DOT MATRIX character or graphics printing.

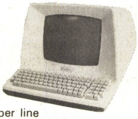
PLUG COMPATIBLE TO TRS-80
(TRS-80 is a regd. trade name of The Tandy Corp.).

SPECIAL
5¼" DISKETTS
$3.95 EACH

$ THE LOGIC SHOP PTY. LTD.

212 HIGH ST, PRAHRAN Vic
3181. Tel (03) 51 1950
91 REGENT ST, CHIPPENDALE,
NSW 2008. Tel (02) 699 4910





How to buy a personal computer.

Suddenly everyone is talking about personal computers. Before you buy, take time to talk with your ComputerLand. We're computer experts who can answer your unanswered questions and show you how useful and how much fun personal computers can be. And we'll help you choose a computer that meets your personal needs.

Who uses personal computers.

Thousands of people have already discovered the Apple® computer—businessmen, students, hobbyists. They're using their Apples for financial management, complex problem solving—and just plain fun. You can use your Apple to analyze the stock market, manage your personal finances, control your home environment, and to invent an unlimited number of sound and action video games. That's just the beginning.

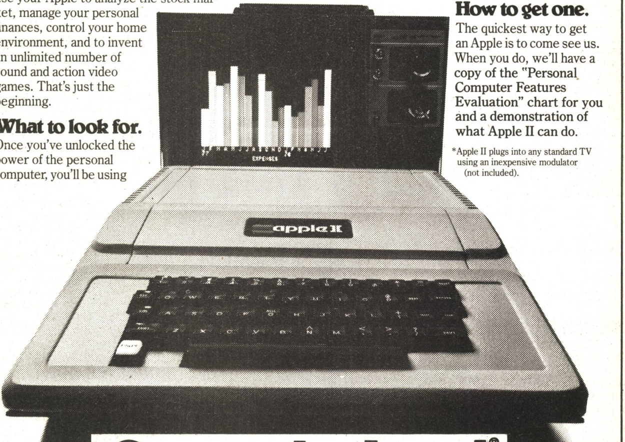
What to look for.

Once you've unlocked the power of the personal computer, you'll be using your Apple in ways you never dreamed of. That's when the capabilities of the computer you buy will really count. You don't want to be limited by the availability of pre-programmed cartridges. You'll want a computer, like Apple, that you can program yourself in an English-like language called BASIC. You don't want to settle for a black and white display. You'll want a computer, like Apple, that can turn any color tv into a dazzling array of color graphics.* The more you learn about computers, the more your imagination will demand. So you'll want a computer that can grow with you as your skills and experience with computers grow. Apple's the one.

How to get one.

The quickest way to get an Apple is to come see us. When you do, we'll have a copy of the "Personal Computer Features Evaluation" chart for you and a demonstration of what Apple II can do.

*Apple II plugs into any standard TV using an inexpensive modulator (not included).



ComputerLand®

in Melbourne

Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.

Decode Morse with your Microcomputer

With a suitable program, your microcomputer can be made to decode Morse code and display the resulting message on a normal ASCII video terminal. In this article the author describes how he developed a suitable program for the Intel SDK-80 development system.

by IAN C. BUTTERWORTH*

The microprocessor appears to me to be an ideal tool for a task like the decoding of Morse code into ASCII. In fact I have found the project a most interesting one, and I believe that other readers will benefit from a knowledge of the pitfalls I have encountered during its development.

In the following article I have tried to describe the program as a set of general algorithms that are not tied to any specific processor. The description of my own system is given at the end, mainly for the benefit of readers with the same SDK-80 development kit.

Basically the algorithms I have developed have two distinct functions. One is to determine the input rate of the incoming Morse coded signal, while the other is to display the decoded information on the screen of a standard ASCII terminal.

Before beginning a detailed description of the algorithms to achieve the above objectives, it is worthwhile considering the format of a Morse signal.

Fig. 1 shows the basic timing relationships for Morse code, with all elements expressed in time units. The unit of time will depend on the data rate. At 20 words/min and 5 characters per word, then one word will be 3 seconds long. This assumes that one character has on average 5 symbols, ie, 3 dots and 2 dashes. Then one complete character will take 13 units of time. Included in the 3 second period will be an end of word space of 5 units and 4 end of character spaces.

As we are assuming 5 characters per word then the total number of units per word will be (13 x 5) + (4 x 3) + 5 = 82 units, therefore one unit of time is 3 sec divided by 82 or 36.5 milliseconds (ms). It is now possible using this basic unit to calculate the lengths of dots and dashes for various data rates. For convenience I have used 35ms and it will be seen that this approximation is not critical to the results.

To translate a Morse signal into its alphanumeric equivalent it is necessary to know the order, number and type of symbols representing the character. To do this the processor must identify each symbol, store the data and determine the difference between the space separating a symbol, character and word.

MORSE SPACING

A dot = 1 unit
A dash = 3 units
Space between symbols forming a letter = 1 unit
Space between two letters = 3 units
Space between two words = 5 units.

Fig. 1

ADDRESS	MORSE	ASCII	MORSE	ASCII	MORSE	ASCII	MORSE	ASCII
1200	4F	31	47	32	43	33	41	34
1208	40	35	50	36	58	37	5C	38
1210	5E	39	5F	30	11	41	00	45
1218	10	49	27	4F	21	55	38	42
1220	3A	43	24	44	32	46	26	47
1228	30	48	37	4A	25	4B	34	4C
1230	13	4D	12	4E	36	50	3D	51
1238	22	52	20	53	01	54	31	56
1240	23	57	39	58	3B	59	3C	5A
1248	52	2F	6E	27	7D	3A	83	2C
1250	65	2E	71	2D	62	22	00	00

FIG. 4

Figs. 2 and 3 represent the flow diagrams for the main objectives given earlier. The process will be better understood by considering Fig. 3 first.

Basically the processor waits until a symbol is present and then measures its length by looping until the input goes to 0. The loop time is fixed, therefore the counter will be a measure of symbol length.

To determine whether the input symbol is a dot or dash, we compare the counter value with a fixed value in register 1. The value in register 1 must be such that it is larger than a dot length and smaller than a dash length. I have chosen the register 1 value to be twice a dot length. This means that there can be a wide variation in input speed without the data being misread.

Having established the type of symbol received, we store a 0 or 1. The input will now be a space and it is necessary to determine the length to see if it is the end of a character or a space between symbols. The method here is similar to the previous loop, except that the loop time is different therefore the value loaded in Register 2 will be different. A trap is included in this loop to check for the end of a message. If the space is longer than 10 units, then it can be assumed that data is no longer being received and the routine is re-directed to the start.

If, after the test with Register 2, (2 x symbol space value) it is determined that it is a space between symbols, then counter 2 is incremented. This counter keeps a track on the number of symbols in a character. If it was a space between symbols, then there is more character data to come and the routine returns to the input for the next symbol.

If the result of the above test was not a space between symbols, then a complete character must have been received. To determine the ASCII counterpart of the received data a look-up table is used (Fig. 4). At this point counter 2 is used to make the stored data unique by adding the counter value to the upper four bits of the stored value. This results in a one to one correspondence with its ASCII counterpart (Fig. 5).

(A)	0	0	0	1	1	1	0	0

STORE VALUE FOR MORSE 8

(B)	0	0	0	0	0	1	0	0

REGISTER 2 — NUMBER OF SPACES BETWEEN SYMBOLS

(C)	0	1	0	0	0	0	0	0

ROTATE REGISTER 2 LEFT (NO CARRY)

(D)	0	1	0	1	1	1	0	0

(A) + (C) = 5CH

(E) 1 2 3 4 5 6 7 8 9 0 A E I O U B C D F G H J K L
M N P Q R S T V W X Y Z / ' (, . - "

FIG. 5 MORSE TO ASCII LOOK-UP TABLE

If the end of the table is reached before the character is found then an error symbol is transmitted and the routine returns to the input.

The next test is to determine if the previous space measured was a space between characters or the end of a

---

* 11 Ferris Street, Christies Beach, SA.

THE GREATEST RANGE OF CALCULATORS AND COMPUTERS IN AUSTRALIA

WHOLESALE PRICES ON BULK ORDERS.

ASK OUR PRICES LAST — WE ARE NEVER KNOWINGLY UNDERSOLD

The CBM™ Computer Business System

New 3000 Series now available

2023 Friction feed

Tractor Feed Printer

COMPUTERS — HARDWARE — SOFTWARE —

AUTHORISED DEALER:

commodore

Dual Drive Floppy Disk

HEWLETT-PACKARD

Count on quality — use HP's

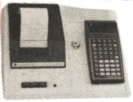
*Prices in brackets exclude sales tax

HP41C Calculator	$359.90	($323)
HP41C Accessories:		
Card Reader	$237	($213)
Printer/Plotter	$425	($382)
Memory Modules	$56.40	($49.10)
Application Packs	$56.40	($49.10)
Solution Books	$15.70	($13.60)
Thermal Paper	$7.50	($6.50)
40 Mag Cards	$25.10	($21.80)
HP34C, 210 steps	$184.50	($165.50)
HP33C, 49 steps	$148	($133)
HP33E, 49 steps	$111	($99.75)
HP32E Sci/Stats	$87	($78)
HP31E Scientific	$63	($56.50)

Also HP97, HP29C, HP38C, HP38E, HP37E.

HP ONLY — POST FREE

PACKAGE DEAL!!



Ti59/PC100C

$510 ($450)
LOWEST EVER
(MAY ONLY)

- TI58C $127 ($112)
- TI59 $229.90 ($265)
- PC100C $237 ($210)
- TI $61.50 ($54)
- Modules 58C/59 $34.50 ($30.50)
- Pakettes 58C/59 $9 ($8)
- 3 Rolls Therm Paper $12 ($10.50)
- 40 Mag Cards $15 ($13.50)

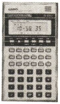
NEW CASIO fx8100

SUPER SCIENTIFIC — 46 FUNCTIONS

PLUS
- CLOCK
- CALENDAR
- 2 COUNT DOWN ALARMS
- STOPWATCH

$71.90 ($63.90)

ALSO
fx502p $149 ($135)
FAI $23.50 ($39)
fx310 $31.50 ($28)
fx510 $41 ($36)



THE H P F

Imagination Machine

$990 POST FREE

—PLUS PROGRAMS—
COMPLETE COLOUR HOME COMPUTER

8K PET

Special $1190

Plus Free!!
16 Programs and Program Manual ($233)

Pack and Post — All LCD models $1.50 anywhere in Australia. Otherwise $2.50 for NSW elsewhere $3.50 per order. (Extra $1.50 for registered) **Sales Tax Forms** must be duly signed and stamped. (Forms available)

bankcard welcome here

Leasing arranged

copy and complete

Please debit my Bankcard $ ......

No .... Expiry Date ....

Signature ....

Name & Address ....

PRICES IN BRACKETS EXCLUDE SALES TAX.

ELECTRONIC CALCULATOR DISCOUNTS

Phone (02) 624-8849 (8am till 3pm), PO Box 106, Baulkham Hills, NSW 2153

NOW AVAILABLE — MICROPROCESSOR BASED VIDEO DATA TERMINALS FOR LESS THAN $1000

The EME-30A and EME-30B are low cost, interactive stand-alone video data terminals. THEY ARE PART OF A SERIES OF E. & M. Electronics video data computer terminals. The EME-30 series is microprocessor based allowing program and hence functional operating characteristics to be changed or added to as requirements dictate. All the EME series of terminals require the addition of a standard video monitor, the output providing a composite video signal suitable for driving monitors directly.

As well as providing all the necessary functions of a teleprinter terminal, extensive editing facilities are included so that data may be composed off line and transmitted to the computer when line is established.

GENERAL SPECIFICATIONS

The EME-30A operates on 240V, 50Hz. Communications is performed in a serial asychronous mode using the EIA RS232C interface. Data transmission rate, parity selection, stop bit, and full and half duplex transmission modes are user selectable. At switch-on, default values are preset automatically. Optional values may be factory installed.

PHYSICAL SPECIFICATIONS

Screen Format

Screen capacity	1920 characters
Number of lines	24
Characters per line	80 or 64 switch selectable
Displayable characters	128 (Upper-lower case, numbers punctuation and controls)
Character generation	5 x 9
Character matrix	6 x 10
Number of scans	10 per character
Cursor type	Flashing underscore
Refresh rate	50Hz (Non-interlaced)

Mode Selection

Local/Line	Allows block transmission of screen data assembled and edited off-line.
Full/Half duplex	Allows all control characters to be displayed
Transparent	for program debugging use.

Editing and Control Facilities

Cursor up, down, left, right, Home (top left)
Character and line Insert and Delete
Erase to end of line
Erase to end of screen
Transmit from home to cursor
Direct x-ray cursor addressing
Tabbing facility
Automatic LF after CR selection.
Cursor and tab control from computer using ESCAPE sequences
True underline capability

Other Features

Since the EME-30 series are microprocessor based, operating characteristics may be added to or modified to suit the user's system.

ASK ABOUT OUR LOW-COST VIDEO TERMINAL EME-20

For further information contact:

E & M ELECTRONICS PTY LTD
136 Marrickville Road, Marrickville, NSW 2204.
Tel Sydney (02) 51 5880; Melbourne (03) 598 9207

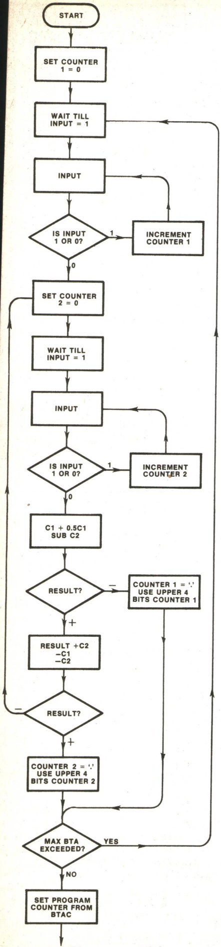


FIG. 2

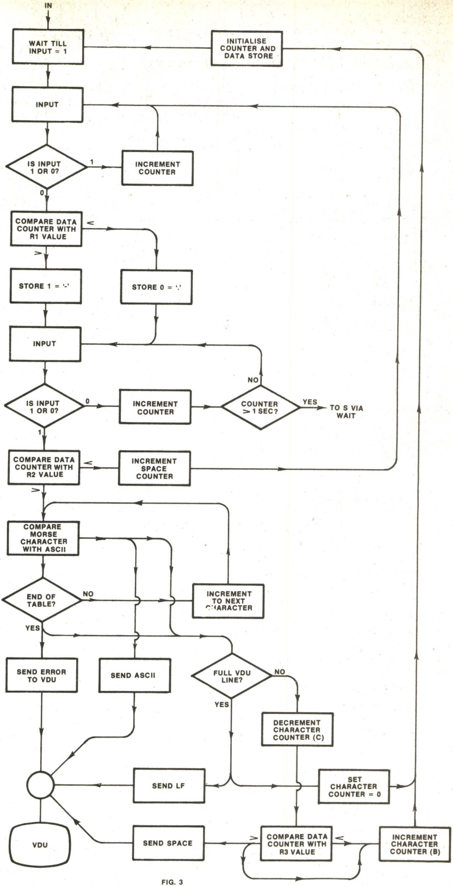

IN
WAIT TILL INPUT = 1
INITIALISE COUNTER AND DATA STORE
INPUT
IS INPUT 1 OR 0?
1
INCREMENT COUNTER
0
COMPARE DATA COUNTER WITH R1 VALUE
<
>
STORE 1 = '-'
STORE 0 = '.'
INPUT
NO
IS INPUT 1 OR 0?
0
INCREMENT COUNTER
COUNTER >1 SEC?
YES
TO S VIA WAIT
1
COMPARE DATA COUNTER WITH R2 VALUE
<
INCREMENT SPACE COUNTER
>
COMPARE MORSE CHARACTER WITH ASCII
END OF TABLE?
NO
INCREMENT TO NEXT CHARACTER
YES
SEND ERROR TO VDU
SEND ASCII
FULL VDU LINE?
NO
YES
DECREMENT CHARACTER COUNTER (C)
SEND LF
SET CHARACTER COUNTER = 0
VDU
SEND SPACE
>
COMPARE DATA COUNTER WITH R3 VALUE
<
INCREMENT CHARACTER COUNTER (B)

FIG. 3

These two flow charts describe the algorithms for a Morse decoder program.

	1	2	3	4	5	6	
RATE W/M	24.5	24.5	30.5	—	30.5	—	μSEC.
	x1	x2	x2	x3	x4	x5	UNIT
25	30.75	61.5	61.5	92.25	123	153.75	DEC.
	04E7	09CE	07E0	—	0FC0	—	HEX.
20	35	70	70	105	140	175	DEC.
	0594	0B29	08F7	—	11EE	—	HEX.
15	52.5	105	105	157	210	262.5	DEC.
	085E	10BD	0D72	—	1AE5	—	HEX.
10	70	140	140	210	280	350	DEC.
	0B29	1652	11EE	—	23DC	—	HEX.
7.5	105	210	210	315	420	525	DEC.
	10BD	217B	1AE5	—	35CA	—	HEX.
5	140	280	280	420	560	700	DEC.
	1652	2CA4	23DC	—	47B8	—	HEX.
2.5	280	560	560	840	1120	1400	DEC.
	26A4	5949	47B8	—	9000	—	HEX.

(A) COLUMN 1 = POINTER VALUE (UPPER 4 BITS ONLY)
(B) COLUMN 2 = REGISTER 1 VALUE
(C) COLUMN 3 = REGISTER 2 VALUE
(D) COLUMN 5 = REGISTER 3 VALUE

FIG. 6

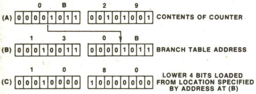


FIG. 7

Fig. 7, above left is an example for an input rate of 10 words/minute.

RATE W/M	UPPER 4 BITS OF POINTER VALUE										BTAC
25	00	01	02	03	04						20
20	05	06									40
15	07	08	09								60
10	0A	0B	0C								80
7.5	0D	0E	0F	10	11	12					A0
5	13	14	15	16	17	18	19	1A	1B		C0
2.5	1C	1D	1E	1F	20	21	22	23	24	25	E0
2.5	26	27	28	29	2A	2B	2C	2D	2E	2F	E0

FIG. 8

word. Register three takes care of this. The value of register three is four units long. If the result is the end of a word, then a space is sent to the VDU.

To prevent characters running off the screen, it is necessary to count the characters sent to the VDU. When a predetermined number have been sent then a line feed is transmitted and the counter reset.

The program described above will run quite well on its own. However the values for registers 1, 2, 3 (Fig. 6) have to be loaded into the program prior to running, based on an estimate of the data rate.

The 24.5 and 30.5us figures refer to the input loop times and these in turn depend on processor instruction time. The values will have to be calculated for the particular processor being used.

Fig. 2 is the flow diagram of the algorithm for loading R1, 2, 3, automatically after measuring the input rate. The pulse width of an input logic one level corresponding to a dot or dash is measured by counter one as described for Fig. 3. When the input goes to zero then the processor waits for the next logic one level and measures the length of the next symbol with counter two.

The shortest of the two lengths is found by comparing the value of counter 2 with 0.5 and 1.5 of counter 1.

(a) If counter 2 is > 1.5 counter 1, then counter 1 = length of dot.

(b) If counter 2 is < 1.5 counter 1 and < .5 counter 1 then counter 2 = length of dot.

(c) If counter 2 is < 1.5 counter 1 and > than .5 counter 1 then counter 1 = counter 2 and both are same symbol.

If condition (c) is satisfied then the routine returns to the second count loop input to look for another symbol. If either (a) or (b) is satisfied, then we have a value in a register that corresponds to a dot length. In fact we only require the upper 4 bits of the register.

Returning to our description of Fig. 3 for the moment, all we require to run this program are values for R1, R2 and R3. If we store in memory these values for various data rates then all we need to do is to jump to a routine that will load the values for us. In practice there are 7 routines, covering the following data rates: 2.5, 5, 7.5, 10, 15, 20 and 25 words per minute. The program takes care of variations in speed between the set points.

So we now need to jump to one of these routines as determined by the input data rate. A branch table is used fo this purpose. The upper 4 bits of th counter register referred to above ar used as the lower 4 bits of the table address. The contents of the table at tha address are used as the lower 4 bits o the address, directing the program to one of the 8 register load routines. This may seem confusing at first reading but Figs. 7 & 8 will hopefully make it clear

The program described here has been run on an SDK-80 Development Kit using the EA VDU (Feb 77). Memory organisation is shown in Fig. 9. The input is via bit 0 of Port A on the user supplied PPI; all other bits on Port are earthed.

There are three sequential input instructions where data length is to be measured. This is done to increase the loop time, otherwise at low data rates the counters could go round more than once giving incorrect data.

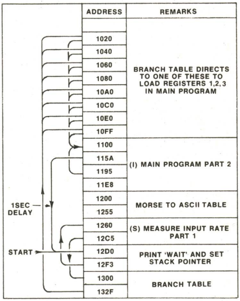


FIG. 9

The baud rate used to output the ASCII to the VDU was 4,800. Trouble will be experienced at high Morse data rates if the baud rate is less than 600. This is because it takes time to send a character to the VDU and at the end of a line the processor has to wait until the last character has been sent before it sends the line feed. During this time the processor is idling and data is still being presented to the input.

If the processing time between the second input loop (measuring the 0 level period) and the return to input after printing the character is significant, then prior to returning to the start the counter can be set with a value equal to the above delay divided by the loop time. In this way the counter catches up with the amount of data lost while processing.

SOFTWARE

ACCOUNTING PACKAGES

DEBTORS	$330.00
CREDITORS	$330.00
DIRECT MAIL	$500.00
GENERAL LEDGER	$330.00
PAYROLL	$500.00
STOCK/INVOICE	$500.00

Packages are written in C BASIC II in Australia. **Source is available** (P.O.A.). Packages supplied on 8" or 5¼" disk and need 80 x 24 serial terminal, 48K RAM, 2 x 240K (MIN) capacity disk drives, 132 column printer.

CUSTOMISING AVAILABLE.

OPERATING SYSTEMS

CP/M VERSION 1.4	$145.00
CP/M VERSION 2.0 (suitable for HARD DISK)	$175.00
MPM VERSION 1.0 (CP/M 2.0 extended for MULTI-USER)	$305.00
CPM374X (transfer between IBM 3741 data sets and CP/M files)	$200.00

LANGUAGES

C-Basic II (Semi Compiler)	$110.00
BASIC-80 (Microsoft Disk Extended Basic)	$305.00
BASIC COMPILER (down to HEX!)	$355.00
FORTRAN-80	$405.00
COBOL-80	$630.00
CIS-COBOL (includes full ISAM)	$860.00
PASCAL/Z (includes VARIANTS)	$400.00
APL/Z80	$393.00
ALGOL-60	$205.00

Full ISAM file utilities are available plus good CARTING PACKAGES.

ASSEMBLERS

MAC (by DIGITAL RESEARCH)	$ 95.00
SID (Symbolic Debugger 8080 code)	$ 85.00
ZSID (as per SID but Z80)	$105.00
MACRO-80 (by MICROSOFT)	$155.00
XMACRO 86 (8086 cross compiler)	$300.00
Z80 CROMEMCO relocatable assembler	$130.00
Z80 Development Package	$103.00
ZDT (Z80 debugger)	$ 55.00
DISTEL, DISILOG (disassemblers)	$ 70.00

EDITORS/WORD PROCESSORS

WORDSTAR (for SERIAL TERMINALS)	$445.00
WORDMASTER	$130.00
POLYVUE 80 (full screen editor)	$140.00
POLYTEXT/80 (text formatter)	$ 90.00
POSTMASTER	$150.00
TEXTWRITER III	$130.00

UTILITIES

SAVER (Reconstitutes files erased by the CP/M command ERA. Display/Alter information on disk sector by sector independantly of file structure!)

WE HAVE MUCH MORE SOFTWARE (INCLUDING COMPREHENSIVE 3D GRAPHICS) AND IT IS ALL DESCRIBED IN OUR COMPREHENSIVE CATALOGUE.

Announcing the

OPAL 1000

The **OPAL** is an 8 slot S-100 system conforming to the proposed IEEE standards for the S-100 bus. A Delta Products Z80a 4MHz CPU card with 2 RS232c serial and 3 x 8 bit parallel ports is used in conjunction with the Delta Products disk controller. Memory is 64k Dynamic RAM. Disk drives are 2 x 8in Shugart SA801R running at double density (480k/drive) fitted with our exclusive disk saver which prolongs the life of the drives and floppy disks. The disk saver also reduces the risk of data loss due to power failures. A PROM monitor is supplied. The operating system is the latest version of CP/M*2.

Price Opal 1000	**$4800.00**
Price Opal 1000 with 64k static	**$5400.00**
Opal 1000 with Beehive DM-20 and NDK S-2000 printer price	**$9650.00**

***Trade Mark Digital Research.**

Corvus hard disk	**$5830.00**
VCR back-up interface	**$1010.00**

SEE OUR CATALOGUE FOR DETAILS

SEND $1.00 FOR OUR CATALOGUE AND TO JOIN OUR MAILING LIST CLUB.

JOHN F. ROSE
COMPUTER SERVICES PTY LTD

33-35 ATCHISON STREET, ST LEONARDS, NSW 2065, AUSTRALIA.
TELEPHONE: (02) 439 1220 TELEX: AA 27901

PRICES SUBJECT TO CHANGE WITHOUT NOTICE. ALL PRICES INCLUDE SALES TAX.

Trendcom 200 High-Speed Thermal Printer

Sooner or later, personal computer uses desire the use of a printer for "hard copy" but most printers are very expensive. So it was with interest that we approached this review of the Trendcom 200 thermal printer which sells for less than $700. It prints text at 80 characters per line and 40 characters per second or graphics at 60 dots per inch.

Thermal printers work by burning the characters into a specially treated paper. The printhead is a line of seven thick-film resistors which have a very short thermal time-constant so they can rapidly change from one character to the next as the printhead moves along the line to be printed. Some thermal printers use aluminised paper which can be difficult to read, but this does not apply to the Trendcom.

The big advantage of thermal printers is that they are quiet. Conventional mechanical printers can be very noisy but with the Trendcom 200 the only noise that the user is conscious of is the sound of the paper being advanced after each line is completed.

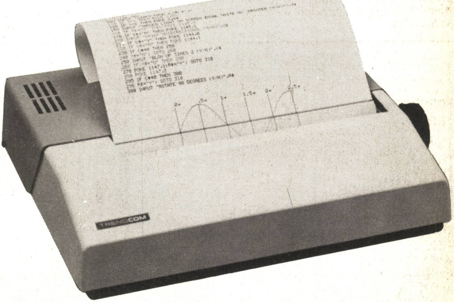
Another advantage of the Trendcom compared to conventional mechanical printers is that it is surprisingly compact, measuring just 317 x 70 x 254mm (W x H x D) and weighing a modest 3.6kg. Not only is the unit itself compact but it is effectively even more space-saving by virtue of the fact that the 216mm wide paper roll is accommodated internally rather than externally as with printers using fan-fold paper.

Since the paper is on a continuous (26 metres) roll, rather than in fan-fold format, there are no problems with initialisation prior to a printing run and there are no perforations to skip over, making this printer easy to work with. There is a disadvantage in that continuous printout is not as convenient to store as fan-fold format but this is a relatively minor consideration.

The Trendcom will recognise and print the full 96 ASCII-character set, using a 7 x 5 dot matrix. The lower case characters have true "descenders" (the tails in j, p, q, y and g) by means of the following compromise: lower case characters without descenders actually occupy a 6 x 5 matrix while those with descenders and upper case characters (including numerals) occupy the full 7 x 5 matrix.

This means that upper case characters actually "descend" by one dot and thus look like a slightly larger font. A sample of the printout is shown in the caption for the photograph on this page.

As with other "intelligent" printers on the market, the Trendcom has full line buffering and bidirectional "look ahead" printing. After one line has been printed left to right, the internal microprocessor examines the next line to choose the shortest print direction. For example, if the next line to be printed is of the same length as the line just printed, the printer will print from right to left. But if the line just printed was short and the next line is much longer, then that line will be printed from left to right. This bidirectional capability gives a considerable increase in the printer efficiency, as well as saving considerable wear and tear on the printhead mechanism.



The Trendcom 200 is a quiet thermal printer featuring the full ASCII character set and continuous graphics. It will interface to most personal computers.

All movement (printing head and paper advance) is controlled by a pair of stepper motors, and as these are the only moving parts in the whole printer, it should be highly reliable.

As is to be expected in a printer of this type, there is a built-in self-test function, which is enabled by a miniature slide switch located in the rear left hand corner of the unit, just under the metal cover. The test takes the form of a printout starting with 80 characters of the ASCII set printed on a single line, and then followed up by 10 lines of varying thickness. The test will continue until disabled by moving the slide switch back.

The graphics mode is software selectable, using two special codes. One is the graphics-select code and the other the text re-entry code. The two codes are 9E hex for entry into the graphics mode, and 9F hex for re-entry into the text mode. These codes assume that the printer is connected to an 8-bit data bus, and not 7-bit, as is the case with many computers which have a printer output port.

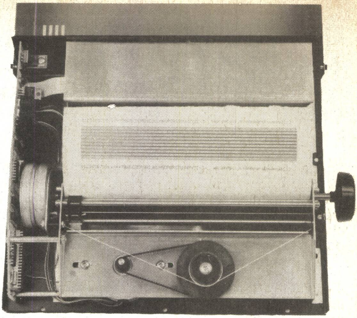
If the computer to which the printer

s connected happens to have one of hese 7-bit printer ports, the two codes vill have to be changed to allow for the ack of an eighth bit. The new codes ecome 1E and 1F respectively. The nly other thing that needs to be done ow is to pull the eighth data input to he printer high via a suitable pullup esistor.

When the printer is set to operate in he graphics mode, there are 480 print ositions per line. This will give you ome idea of the resolution that can be xpected, and also the sheer volume of data that is required to generate even the simplest pattern. There are several ways of operating the printer in the graphics mode, the fastest of which makes use of the bidirectional printing capability.

There is a problem here however, and that is that the data has to be presented to the printer in the reverse order when it prints from right to left. The internal buffer does not invert the data here as it does in the text mode. Secondly, there is a problem regarding the alignment of the image from one line to the next.

The printer was tested by connecting it to the reviewer's Sorcerer computer. The total time between unpacking and having the unit up and running was no more than half an hour or so. The first test consisted of loading some BASIC programs and then listing and running them. The results obtained were very satisfactory.



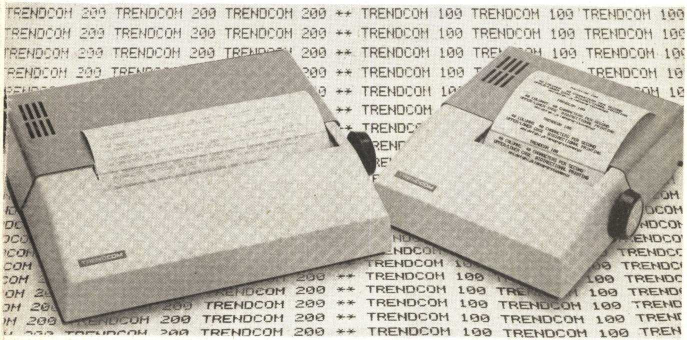
This shows the interior details of the Trendcom 200 and a sample of its self test routine.

The second test was to use the printer while assembling a machine language program (this made use of the full 80-columns unlike the BASIC programs which are limited to 63 columns). Again we obtained a satisfactory result.

In summary, we found the Trendcom 200 to be a very attractive printer, one that takes up very little room on the desk and very quiet in operation. It is a little slower than other printers on the market with a throughput of 40 characters per second, but this is not a major drawback.

The cost of the printer is $610.00 (plus tax) which is quite reasonable when compared to its nearest rivals, particularly in view of its graphics capability.

Further information can be obtained from the Australian agents and distributors: Computerware, 63 Paisley St, Footscray, Victoria 3011. (G.C.)

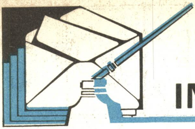

TRENDCOM 200 TRENDCOM 200 TRENDCOM 200 ** TRENDCOM 100 TRENDCOM 100 TRENDCOM 100
TRENDCOM

✱Trendcom 100 $395* **✱Trendcom 200 $610***

Word Processing from:

COMPUTERWARE 63 Paisley Street, Footscray. Vic. 3011.
(03) 68-4200

*Plus sales tax
Price correct at time of publication



INFORMATION CENTRE

PARTS DIFFICULTIES: I am writing about some parts that I am having difficulty in finding. I would like to know the suppliers of the printed circuit board you describe in your article on p39, EA March, 1976. It is coded 76/E02G. Also, I'd like to know the availability of the SCL4024AE integrated circuit. (D.H., Toowoomba, Qld).

● There are at least two sources for every PC board ever published in "Electronics Australia": Radio Despatch Service, 869 George St, Sydney, NSW 2000; and RCS Radio, 651 Forest Rd, Bexley, NSW 2207. The 4024 IC should be readily available from most components suppliers.

METAL LOCATORS: In your November issue you have a circuit of the Prospector on page 58 and on page 56 there is an advertisement for the ETI 549 induction-balance metal locator with audio and meter indication. What I would like to know is this unit better than the Prospector as I am a pensioner and I am partially deaf. (L.B., Berowra, NSW.)

● The audio meter indication on the ETI locator could be an advantage because of your deafness. As far as the performance of each unit is concerned though we are unable to comment since we have not compared the two.

METAL LOCATOR: Having recently constructed your metal locator I would like to make the following comments:— (1) the specified 25m of wire is insufficient. School arithmetic shows 28.3m at least is needed. (2) my wire supplier assured me he had been metric for three years and could only approximate 26 SWG. (3) As I could not obtain a 2.5k switch pot locally I settled for a 5k (4) 4013's were unobtainable here so I used a 74C74 tying set and reset to supply voltage. (5) a 74C00 finished up in place of the 4011. In spite of my use of mounting sockets it was a long weekend. After all this I suppose any results should be encouraging, however there are still problems. The sun causes an alarming frequency drift; further what sensitivity is to be expected? I cannot get a response from an iron pipe 30cm in the ground and a copper wire does not respond at all. (J.C., Sydney, NSW)

● Taking your points in order J.C. 28 metres are in fact required to complete 50 turns on the search coil but 25 metres are enough — the difference is insignificant. The exact wire gauge is also unimportant, 23 or 27SWG could be used for example.

The 2.5k switch pot specified in the circuit diagram could also be replaced with a 5k or 1k log switch pot. The 4th and 5th points you've made are unusual. 4000 series CMOS is much easier to get and the devices you have used in their place are far from pin compatible which would have made things difficult, to say the least.

The problem you have experienced with drift caused by the sun is to be expected considering the sensitivity of the circuit. One reader has informed us that he painted the coil carrier white which resulted in some improvement. The only elaboration we can suggest is to provide improved thermal insulation such as foam plastic.

PLAYMASTER 40-40: I have built this amplifier and am pleased with its performance. The only problem is that even with full bass boost there is insufficient bass. Could you please tell me how to overcome this problem? Also, would you consider publishing a loudness circuit for the amplifier? (P.M. Altona, Vic).

● Providing the amplifier is working as it should, the bass response should not be inadequate. Have you actually checked the frequency response of the amplifier, either using instruments or by comparison with a comparable amplifier? Unless measurements confirm that the response is not flat and that the bass boost is below specification, then it is unlikely that you have a problem.

As far as a loudness control circuit is concerned, most of our staff regard Loudness controls as useless gimmicks while the rest are probably tone deaf.

PHOTOGRAPHY: I would like to congratulate you on the excellent flash meter as featured in the January 1980 issue of the magazine. I had been contemplating buying a commercial meter but I have decided instead to build a meter of your design as it offers the same features at a more attractive price. I have also been considering the purchase of a studio flash system but since seeing your flash meter I have wondered if one of your Staff could design a flash unit along the lines of those commercially available but could be made up by home builders. It should contain those features incorporated in commercial units, including such features as half and quarter power, an in-built modelling light and operation from the mains power supply. Since commercial units are priced from $300 and up, I am sure that if your magazine could develop a reasonably priced unit it would evoke great interest among amateur photographers. (L.S., Newcastle, NSW.)

● Thank you L.S., for your kind remarks relating to the photographic flash meter. We are pleased to know that it has met your need. Thank you also for your suggestions regarding a studio flash system. We have described flash units in the past, the last one being as far back as November, 1966. While you may even find this one worth investigating it would be wise to make sure that all components are still available. We may be able to have another look at the possibility of describing a new flash unit but there are many problems to solve with respect to the availability of suitable components, particularly a flash tube with a modelling lamp, the price of which may be rather high. In short, even if suitable parts were available, the cost of same may be comparable with the price of a commercial unit. We will have a look at it. No promises.

DEPTH SOUNDER: It occurs to me that an article using the LM1812 ultrasonic transceiver chip in a depth sounder able to measure to perhaps 100 metres would be a worthwhile project in view of the popularity of power boating. Keep up the good work. (P.W., East Moonah, Tas).

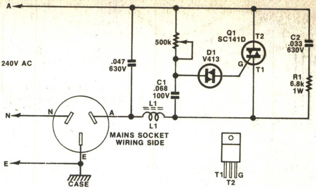
● We agree that the LM1812 chip makes the electronics content of a depth sounder quite easy. However, the encapsulated ultrasonic transducer and the depth indicator are still quite difficult. The preferred depth indicator is by means of a rotating disc and companion chart recorder. Unless we were able to arrange a source for these items we would be unable to proceed with such a project. At the moment, no such source is in sight.

nterference suppression

N SPEED CONTROLLER: This unit performs perfectly, ontrols beautifully. In addition, it provides considerable dio interference on all units at any frequency. Because this ontravenes regulations, I would like your advice on eventative measures before the "RIs" knock on my door. .W., North Perth, WA)

We are surprised that you have problems with the Fan peed Controller, V.W., since it should generate conderably less interference than a conventional unsupressed universal motor operating without an electronic peed control. Nevertheless, if you wish to incorporate a ppression network, we suggest you follow the accomanying modified circuit.

The inductor L1, although not available commercially, is sily made. Start by winding a layer of plastic insulating pe on a 50mm length of 10mm diameter ferrite rod. Close ind a layer of 22 B&S enamelled copper wire over the inlation tape. Then wind insulation tape tightly over the rod a couple of layers, to prevent the inductor from buzzing. lean the inductor leads of enamel and tin them before oldering into circuit. The inductor is then wired between the active pin of the mains socket and the PC board, replacing the previous wire. The capacitor can be wired between the outside leg of the potentiometer and the active side of the mains socket. The use of insulating sleeving on the capacitor leads is recommended.



FAN SPEED CONTROL

2/PC/-

RANSISTOR-ASSISTED IGNITION: I ave a few queries regarding this unit hich I am considering building.

As stated in the article, the spark uration is fixed at 0.6ms. The recognised spark duration in the trade for eliable ignition, particularly under part hrottle condition, is a minimum of ms with 2ms preferred.

We would appreciate your coments on this and how the spark duraion might be extended to say 1.5ms. What detrimental effects might this exension have on the rest of the system?

As stated in the article, coil current is increased by approximately 80%. We wonder what effect this will have on coil life. Many modern coils are no longer oil filled and this could present a heat dissipation problem.

As most of the production systems are generally adequate, when in good condition (ie, after tune-up), we feel that the major advantage of any transistor system is that it maintains the system in peak conditions for a longer period of time and that unless the HT system is grossly neglected, eg, broken TVRS HT leads or spark plugs badly eroded, little improvement in the output of the basic system is required.

We would appreciate your comments on the above. You will appreciate our dilemma. There are some aspects of tune-up which we teach as essential with which this system seems to conflict. (B.F., Port Augusta, SA.)

- We are of the understanding that it is not possible to obtain a spark duration of one millisecond or more unless a high energy electronic ignition system is employed. Even with our system, extending the nominal spark time to 1ms and beyond is unlikely to result in an extended spark duration. Our system, by the way, is based on the Chrysler electronic ignition. The nominal spark time can be increased by increasing the 0.1uF capacitor or the two 10k resistors associated with the PUT.

Note that increasing the spark duration time will have the effect of reducing the ultimate maximum spark repetition rate that the circuit is capable of.

It is true that the coil runs hotter but since (as we believe) Chrysler did not change the specified coil when it changed from Kettering to electronic ignition, we feel reasonably safe in our approach although we concede that there may be some reduction in coil life. To date, we have not heard of any failures.

It is incorrect to say that the major advantage of our electronic ignition with dwell extension is that it maintains the ignition system in peak tune. Our system (and that of Chrysler's) gives a substantial increase in spark energy which must lead to more reliable ignition and fuel combustion. That, in turn, should lead to better fuel consumption.

SQUARE WAVE OSCILLATOR: I have built the square wave oscillator described in the August 1979 issue and am now waiting to see the follow up articles that were promised. I have since read subsequent issues and as yet have not found any of these articles. Could you please advise me when they are to appear in the magazine. (W.S., Auckland, NZ).

- We are pleased to hear that you built the oscillator and at the same time apologise for the lack of follow up articles. All is not lost however as the first of these appeared in the December 1979 issue entitled "Experiment with Digital Counters". This article dealt with the basic concepts involved in digital counting and used the oscillator.

CAPACITORS: Would it be possible to produce a fairly detailed article on the many different types of capacitors and their advantages and disadvantages? For example reference is occasionally made to non-polarised electrolyics.

Would it also be possible to do a fairly detailed review of silicon and germanium rectifiers, the differences between them, reverse breakdown and leakage etc? (R.B., New Zealand)

- We will probably be doing an article on capacitors in our Practical Electronics series soon but we have not planned an article on rectifiers for the near future.

COMMUNICATIONS RECEIVER: In the January to May, 1971 issues of Electronics Australia, you described the Deltahet Mk 2 Communications Receiver. Is this project still up to date or is there any sign of an updated version, using a printed circuit board and other features such as a digital frequency readout? Also, do you have any thoughts for a receiver covering the UHF area of commercial and CB radio? I am a new reader of your fine magazine and I would like to know about the above items. (R.L.C., Warilla, NSW.)

- Although the Deltahet receiver was described about nine years ago, it has come to our attention recently that a few of these receivers are still being built. As such, it could be considered that the design is reasonably up to date but we agree that it could be brought more up to date by the use of printed circuit boards, the use of ICs and perhaps a digital readout. It would be wise before embarking on this project to make sure that all the necessary components are available, or at least suitable substitutes as required. To pre-

A.C.E. RADIO

136 VICTORIA RD, MARRICKVILLE, NSW 2204

PHONE 51-3845

ELECTRONICS CENTRE

BARGAIN PRICES ● PERSONAL ATTENTION ● SLICK MAIL ORDER SERVICE ● SATISFACTION ●

● NEW BSR STEREO RECORD PLAYER ● ● MANUAL OPERATION ●

Model P-207 ● 240V AC, 50Hz ● Auto-Stop ● S-Shape tone arm ● Ceramic cartridge, diamond stylus ● 33-45rpm ● Plays 17, 25, 30cm (7, 10, 12in) records ● Cue lever ● Template for cut-out ● operating instructions ●

$49.95 *P&P NSW $3.00; V, SA, Q $4.00; TAS, WA, NT $5.00*

● ALSO BSR STEREO COMBINATION CHANGER/PLAYERS ●

Model C198. 4-pole motor, S-shape tone arm, fitted with ceramic cartridge, **$55.00** Fitted with magnetic cartridge, **$65.00**

Model C197. 2-pole motor, straight tone arm, fitted with ceramic cartridge, **$47.50**

P&P: NSW $3.00; V, SA, Q $4.00; TAS, WA, NT $5.00

With all the wanted facilities ● Auto or manual operation ● Cueing lever ● Bias compensator ● Adjustable stylus pressure ● 33, 45, 78rpm ● Plays 7, 10, 12in records ● Separate changer and player spindles ● Operating instructions ● Template for cut-out ● Big 28cm turntable ● Diamond stylus ● 240V AC 50Hz.

● BSR BELT-DRIVE RECORD PLAYER ●

ABSOLUTE LATEST MODEL P-200

$99.95

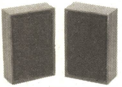
P&P NSW $3.50
INTERSTATE $4.50

STYLISH S SHAPE PICK-UP ARM ● ADC MAGNETIC CARTRIDGE, DIAMOND STYLUS INCLUDED ●

ALSO AVAILABLE WITH WALNUT BASE AND PERSPEX COVER WITH HINGES **$129.95** P&P NSW $5.00 INTERSTATE $7.50

Specs. 240VAC 50Hz, auto or manual operation ● Plays 17, 25, 30cm (7, 10, 12in) records ● 33 and 45 rpm, adjustable counter weight and stylus pressure ● cueing lever ● Bias compensator and anti skate control ● Die-cast platter with mat ● RCA audio plugs and cable, 3-core power cable and plug ●

FACTORY SCOOP ● ½ PRICE BARGAIN ● BRAND NEW A1 QUALITY ● 8"(20cm) 2-WAY SPEAKER SYSTEM ● 8 OHMS ● 10 WATTS ●



$42.00 pair

(JUST AS GOOD AS THE RANK ARENA SYSTEM)

ATTRACTIVE WALNUT CABINET: 52H x 30W x 14½D cm

P&P NSW $3.00, SA, V, Q $4.00 TAS, NT, WA $5.50

FM WIRELESS MICROPHONES

No. 1 Unidirectional

$34.75 *PP $1.00*

No. 2 Omnidirectional

$26.75

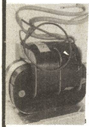
You can't trip over the mic. cable — there isn't any. The signal transmitted by FM microphones is picked up by an FM receiver, operating in the 88-106MHZ.sfreq. band. Mics can be tuned in this band. Specs. FM modulation. Field strength, 50 UV/M at 50ft max. freq. deviation + -75KHZ. Electret Condensor Mic. 2 transistors 1.5 VDC.

Miniature hand held model WM-1 Freq 88-95MHz adjustable. Max freq deflection +75kHz. Range approx 50m outdoors. Elec condensor mic size. 10 h x 35 w x 25 d mm, wt 65g.

PACK & POST $1.00 **$11.95**

C-CORE TRANSFORMERS

LOW NOISE ● HIGH EFFICIENCY ● PRIMARY 240V. 50Hz. CONT. RATING.



MODEL	SEC.V.	AMPS	PRICE	PACK AND POST NSW	V. Q. SA. T.	WA. NT
JT 266	0-18V	8A	**$25.95**	$2.95	$3.75	$5.50
JT 235	260-26V	2A	**$24.95**	$2.95	$3.75	$5.50
JT 248	0-10V	10A	**$25.95**	$2.95	$3.75	$5.50
JT 249	8.5-0-8.5V 15VCT	4A 1A	**$26.50**	$2.95	$3.75	$5.50
JT 274	0-10V 2x0-12V	10A 1A	**$26.50**	$2.95	$3.75	$5.50
JT 253A	0-18V	12.5A 30A PEAK	**$45.95**	$3.50	$5.50	$7.00

SERVICE

Moderate charges — Repairs guaranteed. Radios, Tape Recorders, Cassettes, Amps.

ELECTROLYTICS

Brand new ● "fresh as a daisy" ● under ½ wholesale price. A1 quality guaranteed ● chassis mount.

2500uF/50VW ● 2200/63V
1000/63V ● 100/200V

10 for $5.50

P-P NSW $1.20. Interstate $1.80

GEL-CELL RECHARGEABLE BATTERIES

6V 1.2AH

Fully sealed hi-impact plastic case. 100 x 54 x 24mm.

$5.95 ea. P-P 75c

HMV-VICTOR 4 CHANNEL QUADRAPHONIC REMOTE CONTROL

Master gain control ● 5M 7 core shielded cable with plugs ● min. input imp. 15K ohms — max output imp. 50K ● joy stic balance control, front, rear, left, right ● professional quality anodized aluminium cabinet 145 x 117 x 53mm.

$27.50 P-P NSW $1.50. Interstate $2.50

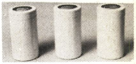
OAK ROTARY SWITCH

3 positions ● 3 pole ● 3 bank

$2.50 P-P 50c

HEAVY DUTY NI-CAD RECHARGEABLE BATTERIES

1.2v



FAMOUS BRANDS

Top quality guaranteed.
Used by many Govt Depts.

Size D 4AH **$6.25** ea. P&P 75c

OR 4 FOR $23.00

P&P NSW $1.50. Interstate $2.50

Size C 1.8AH **$3.75** ea P&P 75c

4 for $14.00

P&P NSW $1.50. Interstate $2.50

SIZE AA 500 MAH **10 for $14.75**

P&P NSW $1.25, Interstate $1.75

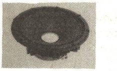
OR 4 FOR $6.40

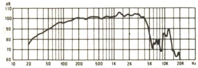
P&P NSW 75c, Interstate $1.25.

☆ SUPER SCOOP ☆

Plessey Foster 15"-12" hi power speakers. Bass/lead guitar ● Hifi ● PA ● Organ ● 8 OHMS IMP.

Model C380K60. 15" Max. power 180 watts (cont.) 240W peak.

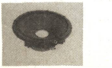


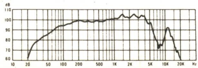


Sound pressure level 101± 2dB.
Freq. response 4500Hz freq.
Reson. 40± 8Hz. Voice coil dia. 80mm.
Flux density 10800 gauss.
Weight 8.5kg was ~~$125~~

$95.00

Model C300K60 12" Max. power 150W (cont) 200W peak.

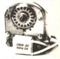




Sound pressure level 99± 2dB.
Freq. response 5000Hz
Freq. reson. 60± 12Hz. Voice coil dia. 65mm.
Weight 5.2kg
was ~~$102~~

$69.95

GEARED MOTOR 240VAC 50Hz 3W



$2.50

P&P 50c

5 RPM. Plenty of torque. With Cam and N/O N/C microswitch. 15 switch contacts per min. OA size. 65 x 60 x 35mm.

Refer Dec 79 EA. New Products Review.

nt a new version of this receiver
uld be a very time consuming task
d we do not have any plans at pre-
nt for such an ambitious undertaking.
so, the idea of developing a UHF
ceiver to cover CB and some com-
ercial frequencies would be quite an
ndertaking and so we regret that we
 not have any plans along these lines
 present.

L-BAND ANTENNA: Could you
ease advise me of the best type of
tenna I could either buy or make to
it all bands on my Grundig 3400
ceiver. (D.H., Pannawonica, WA.)

Your request is a very short one
H., but we are afraid that to answer it
any depth would take a number of
ges of the magazine. And so a
mewhat shorter reply will have to
ffice. First of all, there is no
onomically and physically feasible
tenna which will meet such a re-
uest. We are assuming that you are in-
rested in all frequencies from the or-
inary broadcast band, right up to
0MHz. If you have any bands of par-
cular interest, it would be best to erect
n antenna specifically designed for
ach of these bands, provided you have
ace for them. Alternatively, a good
ompromise for a listener who can only
rect one antenna, would be the well
nown "twin doublet". This has been
esigned to respond well to the more
opular short-wave bands and is
apable of giving satisfactory results.
Details of this antenna were given in
n article entitled "Beating the Noise
roblem" and was published in January
968 (file No. 2/AE/21).

ESISTORS: For my own benefit I ran a
rogram on my TRS-80 of resistors in
arallel. To keep it simple, I restricted it
o 2 to 4 resistors; 3 figures, E-12 series;
 ohm to 10 ohms; .04% tolerance
ithout a printer; 3 decades wide. It
ook over 40 hours to run in BASIC
hough I did not keep accurate time.
Twice to my knowledge you have
ublished series and parallel ranges
with four-figure accuracy. Can you tell
me how long your program took to run
lease?

There are a lot of holes in my series
but I expected as much. I am not disap-
pointed in the result only the time it
took. (J.B., East Bentleigh, Vic.)

● We did publish two articles as you say, though both were contributed so we have no way of knowing how long they took to execute. The program used to generate the tables was written in Fortran and a listing of the program can be found in the first article which was published in June 1975.

It should be noted in passing that this program would have taken considerably less time than 40 hours. The reason for this being that the program would have been compiled and an assembler object-program executed which would be many times faster than the interpreted BASIC program you ran.

BFO FOR SSB RECEPTION: I have a Sony AM/FM 6-band radio but it is not equipped to receive SSB signals. I understand that it is possible to receive SSB signals on this type of receiver by adding a BFO. I have seen some BFOs described in some overseas publications but they present problems with respect to components. Could you advise me if a suitable BFO has been described in your magazine. If so, how can I obtain a copy of the article? (G.W., Karingal, Victoria.)

● It is usually possible to add a BFO to the type of receiver which you have in mind G.W., and fair to good results may be obtained. It depends to some extent on the skill of the operator. Before embarking on building a BFO for the purpose, it is important to determine the intermediate frequency of the receiver. This is usually about 455kHz. We described a suitable BFO for this frequency in January, 1969 (file No. 2/BFO/2).

TWIN TEN: The Playmaster Twin Ten stereo amplifier described June 1979 notes "that no insulating bushes are required to mount the BD140 transistors". A glance at the circuit diagram in the previous month's issue would show that this would short the transistor to earth. (K.J., Toowoomba, Qld)

● No insulating bush is required for TO-126 transistors because they have an integral plastic bush inside the mounting hole. An insulating mica washer is still required to isolate the metal tab.

Electronics Australia Reader Services

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

PROJECT QUERIES: Members of our technical staff are NOT available to discuss individual projects, either in person at our office or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the past two years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

BACK NUMBERS: Available only until our stocks are exhausted. Within three months of publication, face value. Four months and older, if available, $2 (includes storage fee). Post and packing 60c per issue extra.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

SUBSCRIPTION SERVICE

ELECTRONICS Australia

Subscription Rates
$20.00 per year within Australia.
$A23.00 per year elsewhere.

Make sure you receive every copy of the magazine by ordering it from your newsagent or the publisher For publisher subscriptions post this coupon, with your remittance, to Electronics Australia Subscription Dept., John Fairfax & Sons Ltd, GPO Box 506, Sydney, 2001 Subscription will start with first available issue

Name . . . .
Address . . . .
Postcode . . . . Enclosed is . . . . for . . . . years

MARKETPLACE

FOR SALE

SAVE 20% on 48k Apple + twin discs, Diablo 1650 daisy printer-all near new in mint condition. Available singularly. Ring (02) 547 1408 or 908 2235 after 19-5-80.

TRS-80 GENERAL LEDGER ACCOUNTING SYSTEM Level 1, uses 2k memory. Cassette $14.00 Micro-Basic 80, 9 Myers Crt, Doncaster, Vic. 3108 (03) 848 5549.

COMPUTER CASSETTES: Top quality C20 "leaderless", fully guaranteed 1 — $1.80, 5 — $8.00, 10 — $16.00, 100 — $100.00.
LIGHT PEN: to suit TRS80 with software cassette (9V battery required) only $19.00 assembled $14.00 kit both items plus postage 90c.
Deforest Software 26 Station Street, Nunawading (03) 8789276.

DREAM PROGS. Life, Nim, data logger, useful sub-routines and simple maths games. 10 progs. in all plus improved EA games. Listing $2.50. Cassette $4.50. B. Mitchell, Cooriemungle, 3268.

TRS-80 & COMMODORE PET/CBM programs for business & education, also mentally stimulating games. Send SAE for latest list. Softronics Micro Systems Box 238 P.O. Lindfield NSW 2070. PET/CBM dealers.

SORCERER Applications software. No trivia. Statistical, educational, home management, file manipulation. Catalogue $1. I. Gray, 9 Kelly Pl., Higgins ACT 2615.

FREE OFFER!
1 x BC204 (BC177).
Send 9 x 4 Stamped SAE NOW!!!
MICRONICS, PO Box 175,
RANDWICK, NSW 2031

LOW COST PRINTER $160 + TAX
Alphanumeric, up & low case, electrosensitive printer. 16, 32 or 20, 40 chars/line 2 lin/sec. Plugs into PIA. M68 software $5.
SAILING RESULTS COMPUTER
Does timing and yardsticking; all classes
NEBA DESIGN 459-6778
20 LEONARD ST.,
WEST HEIDELBERG, VIC. 3081.

THANK YOU
to
everyone who supported
the Australian Amateur
Delegates to WARC 79 —
their presence WAS worth
the effort.

To ensure continuity
support the WIA —
All Membership enquiries to:
WIRELESS INSTITUTE OF AUSTRALIA
P.O. BOX 150, TOORAK, 3142

REVOX MK IV with factory dolby, new $1750 asking $1200 negotiable, brand new condition (02) 36 4832.

2114-2 RAMS (memory 1C) static T.T.L. 1K x 4BITS, fast R/W time $4.50. Low power, suit ETI FEB. '79 16k RAM PROJECT. Contact 699 9297 (H) or 1 Wilson Lane, Redfern 2016.

AMIDON CORES — REFER ARRL HANDBOOK. Iron powder and ferrite toroids; Ferrite beads and sleeves for wideband RF amps. Large SASE for data/price list. R.J. & U.S. Imports, Box 157, Mortdale, NSW 2223.

ABSOLUTELY FREE!!! One of BC204 (BC177). Send 9x4 stamped SAE NOW!!! Micronics, PO Box 175, Randwick, NSW 2031.

EPROMS — 1792A $2.50; 2708 $6; 2758 $7; 2716 $25; micro 8085 $16. Phone AH (02) 872 2800.

OSCILLOSCOPES (Tektronix, Telequipment, Advance); RF Bridges; chart recorders; multimeters and misc. items. Details D. M. Chambers, Brisbane Q. (07) 377 3948 bus. hrs.

IMPORTED English power amps, 120 watts RMS modules $200 (02) 36 4832.

EXCITING RANGE of software for use by all owners of popular brand computers. Write for our catalogue to Supersoftware c/o Lane Cove PO Lane Cove 2066.

WANTED

AKAI Tape Deck GX 635D. Private Sale. Phone Sydney NSW 74 2924.

NICKEL CADMIUM BATTERY CHARGER - CYCLER - TESTER
(patent pending)

"Deltamatic 1000" is the first programable Ni Cad Charger/Cycler/Tester with digital display to indicate the capacity of your battery. Constant charging and discharging currents are switch selectable from 10mA to 1A in 10mA steps. Built-in timer (15 min to 16 hours) automatically switches from fast charge to trickle charge.
Plot Graphs, compare and test your batteries under simulated operating conditions.
Ring or write for literature.

DELTA SCIENTIFIC PRODUCT DISTRIBUTION
Red Bank Court, St. Albans 3021
Phone (03) 366 3742

RESISTOR SALE
Top quality ½W carbon film resistors. 10 OHM — 10 MEG. 3c ea. or $2.50 per 100. No minimum quantity. Will mix any values. Get some of these now & avoid paying top dollar for these common components.
If you are a beginner, seasoned hobbyist or just want to stock up, we have available packs of 100 most commonly used resistors at $2.50.
First 100 purchases of $10 & above will receive a free veroboard pin insertion tool.
One PP charge of $1.00.
R & C Electronics, PO Box 68,
O'Halloran Hill, South Australia 5158

DISPLAY ADVERTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $12 per col cm.

Please state classification: For Sale, Wanted, Reader Service, Position Vacant, Position Wanted, Business For Sale, etc . . .

CLASSIFIED RATES $3 per line per insertion payable in advance. Minimum two lines.

CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Monday of each month.

ADDRESS all classified orders, copy, enquiries, etc, to: The Advertising Manager, **ELECTRONICS AUSTRALIA**, Box 162, Beaconsfield 2014.

READER SERVICE

COMPUTERIZE your club, society or association's membership mailing list. Fast, efficient printout of adhesive labels. Moderate charges. Selective coding of members' names. Write: COMPUTERLIST, PO Box 9, Crow's Nest, NSW 2065 or phone (02) 437 6681.

"CALLING ALL DXERS — are you getting value for money with your current DX Club? If not then why not see what the Australian Radio DX Club has to offer you. A monthly magazine with an average of 23 pages each month, meetings in Sydney, Melbourne, Adelaide and Perth. Also special services and products to improve your Dxing. For full details write to ARDXC PO Box 79 Narrabeen NSW 2101 enclosing a 30c stamp."

PROM/PAL PROGRAMMING — competitive rates 2708, 2716 MMI 63XX series – 08, 09, 35, 36, 40, 41, 80, 81, 84, 85. All PAL's includes assy. from logic equations and listing (03) 534 4347.

TRS-80 Level II basic and Z80-8080 and SC/MP machine code programs written or modified to your requirements. E-Proms 2708-2716 copies or programmed as per your listing. Micro-Computers repaired or modified as required. Also available various S100 Boards assembled and tested. Inquiries invited to Micro-Assice PO Box 49 Sandy Bay, Tasmania 7005.

BUSINESS FOR SALE

YEPPOON, QLD. Well est. marine electronics business. Must sell due failing sight. Good living for competent engineer, whom vendor will introduce and advise. Virtually unopposed over 400km coast. Agencies. Good lease, low rent. $15,000 WIWO with huge stock comps, test gear. Phone (079) 39 7952 evgs.

COMPUMATIC MARK 2
(patent pending)

The first digital controlled Darkroom Timer calibrated in f stops. Timing range from 1 sec. to 1 hour in 0.1 f stop increments. Illuminated dials and touch-controlled switches are added for easy operation.

Ring or write for illustrated literature.

DELTA SCIENTIFIC PRODUCT DISTRIBUTION
Red Bank Court, St. Albans 3021
Phone (03) 366 3742

BRASS SHIPS CLOCKS SMITHS 8 DAY 7 INCH DIAMETER $110

Post A **$1.75**; B **$3.00**; C **$3.60**.

GENUINE EX ARMY WRIST WATCHES

Complete with nylon band **$19.50**
Post $1.10

P.M.G. TYPE TELEPHONES

Standard desk type with magneto bell calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line. **$39.50**

(2 TELEPHONE SETS)

$2 Cartage to Rail. Freight payable at nearest attended Railway Station.

RECEIVER No. 210

2-16 M/cs **$75**
Transmitter No. 11 suits 210 **$35**.
24 volt Power supply to suit above **$15**.
Or complete station with Headphones, Mic. **$110**.

EX ABC MAGNETIC RECORDING TAPES ¼"

PROFESSIONAL QUALITY

5" x 600'	**$1.50**
7" x 1200'	**$2.75**

P + P $1.30
10½" x 2400' $7.95
P + P A.$1.65 B.$2.75 C.$3.10

COLLINS INDEPENDENT SIDEBAND TRANSCEIVER TRC/75

Fully synthesised transceiver with am, upper, lower and independent sideband operation, 1KHz steps from 2MHz to 29.999MHz 1 microvolt sensitivity, 2.5KHz bandwidth ssb, 6KHz bandwidth AM 1 RW. PEP max output. Fully automatic tuning of both transmitter and receiver from remote control unit. Complete with automatic aerial coupling unit, mic, headset, etc, 400Hz supply.
Ideal for amateur use.
PRICE $750

COLLINS SYNTHESISED 1 SB RECEIVER

TRC/75 receiver section of transceiver specification as above.
PRICE $400

TELEPHONE WIRE

1 mile twin (2 miles) genuine ex-Army Don. 8 perfect condition **$45.00** per drum, **$5.00** cartage to rail freight payable at destination.

20X to 60X ZOOM TELESCOPE

With Tripod, **$115.50**.
Post **A$2.25**, **B$4.10**, **C$6.10**.

RCA 44BX MICROPHONES

PROFESSIONAL QUALITY $75
P&P A. $1.80, B. $3.50, C. $4.55, D. $4.55.

AERIAL CAMERAS

WITH 8" FL 3" DIAM. LENS F24 MARK IV 2.9 LENS STOPS 11, 8, 5.6, 4, 2.9 — **$75**
$2 cartage to rail freight. Payable to nearest attended railway station.

PENTAC LENSES

3" DIAM. 8" FL WITH DIAPHRAGM STOPS 11, 8, 5.6, 4, 2.9. MOUNTED IN METAL HOUSING — **$65**
POST: A. $1.85, B. $3.25, C. $4.10

PRISMS

4" SQUARE FACED RIGHT ANGLE PRISMS TOP QUALITY EX AIR FORCE — **$65**; OR LENS & PRISM FOR **$120**.
POST: A. $1.75, B. $3.00, C. $3.60

SOLENOIDS

200 MA 24 volt, ⅛in push movement, **$2.50** P+P 80c

NIFE CELLS

1.2 volt, fully charged, 4in x 3in x 1in 4 AH.
$1.50 each. P&P 80c.

CENTRE DRILLS

15/64 x 15/64
Carbon steel **$4.00** doz, Post 60c

ARTILLERY DIAL SIGHTS MK2

Can also be adapted as a Dumpy Level or as base for a telescope has full 360? 5½" diam. gunmetal rotating circle. Adjustable elevation and depression. Has top grade ¾" diam. object lens. F.L. 10" with cross hairs, eyepiece, ½" right angle prism — height 10" — weight 3½kgs. With leather carrying case. Original cost $300.
Our Special only **$27.50**
P&P A.$2.25 B.$4.00 C.$6.00

POSTAGE KEY:

A: NSW
B: Vic, Qld, SA
C: NT, Tas.
D: WA

VALVES

BRAND NEW

6SN7	**$1.95**	6BM8	**$1.95**
5U4	**$1.95**	6GV8	**$1.95**
EF50	**$1.50**	6AK5	**$1.95**
		1H6	**$1.50**
2x2	**$1.50**	832	**$5.00**

P+P 80c

6x4	**$1.95**
VR65	**$1.50**

STC HIGH IMPEDANCE HEADPHONES

3400 ohms, brand new, only **$5.95** pair.
P&P, A $1.65, B $2.75, C $3.10.

ZOOM SPOTTING SCOPES

30 x 30
LENGTH 12½", HEIGHT 10"
WEIGHT 1¾ lb
$32.50

45 x 40
Length: 16in
Height: 10in
Weight: 2lb
$49.50

High grade coated lenses. Ideal for pistol and rifle ranges or general viewing. Zooms in from very low to high powers. Complete with tripods.
POST: A. $1.75, B. $3.00, C. $3.60

TELESCOPES

25 x 30 $13.50
P&P A. $1. 30

SPY TELESCOPES

8 x 17 mag size of a rifle cartridge extends to 8". Only **$8.95** each, post 60c.

BINOCULARS

PRISMATIC Coated Lenses. Brand new
Complete with case.

		P&P	
8 x 30	**$42.00**		
7 x 50	**$48.95**		
10 x 50	**$51.00**	A	**$1.75**
12 x 50	**$53.00**	B	**$3.00**
20 x 50	**$65.00**	C	**$3.10**
20 x 65	**$125.00**		

SMALL CLIP-ON POCKET TELESCOPE

15X **$7.00**, **P+P 80c**

THEODOLITES

Made by Wilds Microptic, with tripod Model T2 reads down to one second of ARC **$1000** (Usual Price **$3200**).
Freight payable at nearest attended R'way Stn.

C42 set 36 to 60M/Hz with 24 volt power supply headphone mic. leads etc. **$95**. Or 42 set separate **$65**.

AIRCRAFT INSTRUMENTS

Directional Gyros.
AN5735-1 Air Operated.
$35
Sperry Artificial Horizon.
AN5736-1 Air Operated.
$45.
Slip and Turn Indicators
$17.50.
P&P
A. $1.65, B. $2.75, C. $3.10

MAGNESIUM DRY CELL BATTERIES.

MAGNESIUM DRY CELL BATTERIES. Suits PRC25 and dozens of other uses. 15 volts long life.
Only **$1.50** each. P & P A **$1.35**, B **$2.75**, C **$3.60**.

ANEROID BAROMETERS

In brass case, made in London, **$39.50**
P&P A. **$1.65**
B. **$2.75**
C. **$3.10**

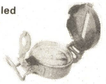
CONDENSER LENS

2½" diam 2" F.L. **$1.50** each or **$2.50** per pair. P&P 80c.

IMPELLER PUMPS

New gunmetal body, Stainless Steel Shaft, Neoprene Impeller. Up to 15ft. Lift, suitable for almost any type of liquid. Self priming. Ideal boat bilge pump, sullage drains, etc. Approx. size 8" x 5" ⅜" **$35.75**, ½" **$51.00**, ¾" **$56.50**.
P+P: A. $1.95, B. $3.50, C. $4.60

Liquid filled compass



With magnified lens sight and degree reader.
Only **$7.95** each. Post $1.30

POLARITY & CURRENT CHECKER

3 volt to 400 volt. Simple leads and prods quickly determines positive or negative with illuminated indicators, also checks AC current and intensity, fully insulated only **$4.95**, pp $1.30.

COLLINS COMMUNICATIONS RECEIVERS

500Khz to 30Mhz
Type 51J-4 $350.00
Type R/391 $500

WRIST WATCHES SWISS JAEGER

Le Coultre ex RAAF rated one of the world's best in smart chrome case with black dial. Original cost $250.

SPECIAL **$49.50**
Post **$1.30**

PRISMATIC TELESCOPES

15 x 50 Ex RAN — black enamelled brass. Length 16", weight 5kg. Price **$39.50.**
$2 cartage to rail, freight payable at nearest attended railway station.

ZOOM FOCUSING MICROSCOPES

Zoom focusing microscopes, 750X battery and mirror illuminated Zoom
$31.75
P&P A $1.65, B $2.75, C$3.10.

DIRECTOR LEVELS

Ex Army No 9 with azimuth horizontal circle and vertical adjustment suits all types of levelling. In leather case
$95
P + P A**$1.75** B**$3** C**$3.60**.

MARCONI SIGNAL GENERATOR

Brand new type TF801A-1 Range 10 to 310MHz AM Continuous. Complete in original case — with instruction book, power leads, spare valves, etc.

$600 value!
only **$195**

$2.00 cartage to rail. Freight payable at nearest attended railway station.

16MM SOUND PROJECTORS IN GOOD WORKING ORDER

240 volts operated complete with Speaker and Amplifier.

BELL & HOWELL **$195**.
$1 Cartage to Rail. Freight payable at nearest attended Railway Station.

SELSYN MOTORS MAGSLIP

TRANSMITTER 3" MK2 $20.00

Post Packing A. $1.75, B. $3.00, C. $3.10

MAGNIFYING GLASSES

4" Magnifier suspends from neck and rests on chest, leaves hands free ideal for mum or gran, sewing, etc.
$6.30

4" Hand held	$5.95
3" Hand held	$3.80
2½" Hand held	$2.65
3¼" Rectangular	$4.25
4" Magnifier on stand leaves hands free	$10.75
Illuminated 10 x power magnifier	$6.60

Postages $1.30 extra

Deitch Bros.

70 OXFORD STREET, SYDNEY 2010

SORRY NO C O D

Video Disc . . . ctd from P11.

controlled by comparing the phase of the line synchronisation pulses with a crystal oscillator and feeding the derived signal to the motor speed-control circuit.

So how does all this technology translate in practice?

Well, I thought that the demonstration was impressive, even if Philips did do itself the disservice of displaying an NTSC version — the only one available. As with any other NTSC system, small phase changes in the signal along the signal processing path result in colour aberrations. Although discernible on the display model, this problem would not be evident to the viewer in PAL versions.

Another problem which surfaced during the demonstration was software quality, with signal drop-outs and noise on the audio evident on some discs. However, while admitting that there have been disc production difficulties, Philips says that the quality problem was confined mainly to early discs. Certainly, some of the more recent discs demonstrated left little room for complaint.

The player itself is about the size of a VCR and is easily operated by means of a row of pushbutton controls along the leading edge of the case. A single slider control looks after the variable slow-motion facility. By making the player easy to operate, Philips has overcome a major criticism levelled at VCRs — that the average consumer found the controls too complicated.

I particularly liked the index feature whereby the frame number can be made to appear on the screen simply by pressing the "index" button. This feature, when used in conjunction with the search and freeze frame facilities, allows any given frame to be quickly located and displayed. Pressing the "still forward" button gives the next frame, while the "still reverse" button gives the preceding frame.

Undoubtedly, the frame freeze and search facilities will help establish VLP as an institutional-industrial-educational standard.

But it remains to be seen whether the Philips VLP system will win mass market acceptance. At around the $750 mark the consumer, already suspicious of video technology, will take a little convincing that he really needs (or wants) a video disc player, be it from Philips, RCA, JVC or anyone else. And if the end result is a multiplicity of standards, he could well put his money back into his pocket, leaving the contenders high and dry.

The race to perfect and market a viable video disc system at a pr attractive to the consumer is still v much at first base!

CSIRO

QUANTITATIVE EVALUATION OF MINERAL AND METALLURGICAL SAMPLES BY SCANNING ELECTRON MICROSCOPE IMAGE ANALYSIS

CSIRO Division of Mineral Chemistry has recently developed an image acquisition and image analysis system for attachment to a scanning electron microscope. This system uses X-ray and electron signals to produce compositional or elemental image maps of individual particles or of sections of mineral, ceramic or metallurgical samples. These maps are interpreted in an on-line minicomputer, by software also developed by CSIRO, to give quantitative descriptions of the particles or sections.

Offers are called for commercial development of the entire system, or the image acquisition system alone, or for modular parts of it, or for application of the image analysis and feature extraction aspects. Respondents should indicate their present commercial involvement in appropriate technical fields, the way in which they intend to collaborate with CSIRO in present and future development, their access to international markets, and the time scale in which they expect to operate.

Further details can be obtained in the first instance from the Chief, CSIRO Division of Mineral Chemistry, PO Box 124, Port Melbourne, Vic 3207. Arrangements may then be made to discuss technical matters with a member of the Division.

Proposals should be in writing and received by the Officer-in-Charge, Commercial Group, Bureau of Scientific Services, PO Box 225, Dickson, ACT 2602 before 26 May 1980.

pascal (UCSD) business software

Modified to YOUR Hardware requirements

- COMPREHENSIVE PAYROLL
- MEDICAL ACCOUNTING
- MAIL ORDER ACCOUNTING
- GENERAL BUSINESS
- SPECIAL DEVELOPMENTS

SPECIAL DISTRIBUTOR PRICES

SIX 'S' GROUP OF COMPANIES

PHONE (052) 22 2844

39 GHERINGHAP ST., GEELONG, 3220

* EVERYTHING FOR YOUR OFFICE *

ADVERTISING INDEX

ADVERTISER	PAG
A. & R. Soanar	70, 1
ASP Microcomputers	1
AWA Ltd	
Ace Radio	1
Adcola Products	
Alfred Dunhill International Ltd	facing
Allen Digital Computer Organ Studios	
Ampec Engineering Co Pty Ltd	facing
Audio Engineers Pty Ltd	
Audio Telex Communications Pty Ltd	
Australian Film & TV School	
Australian Government	1
Australian Government Recruiting	
B.S. Microcomp	1
Bright Star Crystals	
C.Q. Electronics	
Cema (Distributors) Pty Ltd	10
Chapman, L.E.	
Chapman, Maurice	
Classic Radio	8
Coates, H.F. & Co. Pty Ltd	10
Computerland Melbourne	107, 11
Computerware	12
Crompton Parkinson (Aust) Pty Ltd	3
David Reid Electronics	5
David Ryall	6
Defi Agency	1
Deitch Bros	12
Delta Scientific Product Distributors	12
Dick Smith Electronic Group	20, 21, 34, 62, 8
Dick Smith Electronic Group	90, 110, IF
Dorf Microcomputers	10
Dynaudio (Aust) Pty Ltd	3
E. & M. Electronics	11
Electrocraft	6
Electronic Agencies	8
Electronic Calculator Discounts	11
Electronic Development Sales Pty Ltd	45
Etone Pty Ltd	19
Hagemeyer (Aust.)	IBC
Hitachi Denshi Ltd	68
Home Computer Show	112
Instant Component Service	79
Instant Software	111
International Correspondence Schools	facing 96
John F. Rose Computer Service Pty Ltd	119
Lafayette Electronics	96
Logic Shop, The	113
Looky Video	109
Maylands Business Machines	101
McGills Newsagency Pty Ltd	103
Micronics	126
National Panasonic (Aust.) Pty Ltd	14, OBC
Neba Design	126
Pennywise Peripherals	108
Philips	92
Plessey Components	63
RCS Radio	99
R. & C. Electronics	126
Radio Despatch Service	78
Radio Parts Group	64, 85
Rank Electronics Pty Ltd	2
Rod Irving Electronics	49, 68, 77
Rowe, H. & Co.	16
Royston Electronics	63, 67
Sansui Electric Co. Ltd	facing 32
Soundair Hi-Fi	37
Standard Components Pty Ltd	67
Stanton Magnetics, Inc.	36, 67
Stotts Technical College	27
Systems Stationery	128
Tandy International Electronics	10, 91
Vicom International	40, 88
Video Technics	58
Warburton Franki	38, 55, 92
Wireless Institute of Australia	93, 126

When it comes to speaker design, JVC goes 2969 times further.

Traditionally, speaker systems have been designed by a tedious trial and error proccess, by which individual combinations of speaker, crossover and enclosure combinations are analyzed—one at a time—until the desired sonic results are achieved.

JVC has put an end to these time-consuming and archaic procedures, with a revolutionary new system called Phase Moire (Mor-ay) Propagation Technology, that uses a specially-constructed device to move a test microphone in a way that creates and preserves, via computers, video and high-speed filming, a field of nearly 3000 sound testing positions.

By viewing the film, our engineers can actually see what a speaker will sound like before they get too far into the design process.

The initial result of our unique Phase Moire Technology, combined with a great deal of human engineering, is the SK-1000. This unusually-efficient, extraordinary-sounding three-way speaker system delivers truly magnificent, rock-solid bass from its 12″ free-edge woofer and heavy magnet structure. Capable of handling up to 170-watt peaks (85 watts RMS), the SK-1000 reproduces vocals and midrange with unusual smoothness, thanks to our specially-designed 5″ midrange driver. Clear, crisp, brilliant highs are dispersed evenly within the listening area from a 1″ soft-dome tweeter.

We also give you complete control over midrange and tweeter response with a pair of front-panel level controls.

But all the technology in the world can't fool two of the most sophisticated testing devices known: your ears. And all the words in the world can't tell you what the SK-1000 (and its two smaller companions, the SK-700 and SK-500) really sound like.

So we suggest that you hear what we've been talking about at a JVC dealer.

For details on all
JVC Hi-Fi Equipment,
write to JVC Advisory Service,
P.O. Box 307, North Ryde,
New South Wales 2113.

For pure Hi-Fi entertainment!

JVC

the right choice

WT94/78

Technics Q Series.
We can't say they're perfect. You wil

Nobody's perfect, but Technics quartz-locked direct-drive Q Series turntables come incredibly close.

With speed drift a miniscule ±0.002% - that's 99.998% accurate; wow and flutter of only 0.025% WRMS and rumble of -78 dB (DIN B) it's no wonder that Technics is the choice of top broadcasting stations and discos throughout the world.

The Q Series: the SL-Q3 automatic and SL-Q2 semi-auto both have soft-touch front panel controls for operational convenience. To help overcome any possibility of acoustic feedback they are mounted on a base made of Technics unique non-resonant compound.

The highly sensitive, low mass S-shaped tone arm features a genuine gimbal suspension. The one-piece moulded aluminium headshell ha gold plated contacts for maximu conductivity.

You might think you have to b to afford Technics Q Series. You d Your Technics dealer can advise h surprisingly reasonable they are.

Technics

Technics Advisory Service, P.O. Box 319, North Ryde, N.S.W. 2113

T.79.35